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Editor's Note

There are not many student-run academic journals, so *The Nebraska Educator* is excited to provide a forum for researchers, scholars, policymakers, practitioners, teachers, students, and informed observers in education and related fields in educational settings in the United States and abroad. Now in our fourth year, it is exciting to see the work that continues to be accomplished when those interested in educational research have a venue to share their contributions. To date, articles published in the previous three volumes of our journal have been downloaded more than 13,000 times by readers all across the globe.

The Nebraska Educator has four main goals with its published research: (1) to familiarize students with the publication process, (2) to facilitate dialogue between emerging scholars, educators, and the larger community, (3) to promote collegiality and interdisciplinary awareness, and (4) to establish a mechanism for networking and collaboration.

This publication would not have been possible without the guidance and assistance from faculty, staff, and graduate students across the University of Nebraska-Lincoln, particularly those in the College of Education and Human Sciences. We are also grateful for the work of Paul Royster at Love Library, who has assisted us with the final formatting and online publication of our journal since our very first year. In addition, we would like to thank the Department of Teaching, Learning, and Teacher Education's Graduate Student Association, whose financial contributions helped to launch our journal.

The Nebraska Educator is an open-access peer-reviewed academic education journal at the University of Nebraska-Lincoln. This journal is produced by UNL graduate students and publishes articles on a broad range of education topics that are timely have relevance at all levels of education. We seek original research that covers topics which include, but are not limited to: (a) curriculum, teaching, and professional development; (b) education policy, practice, and analysis; (c) literacy, language, and culture; (d) school, society, and reform; and (e) teaching and learning with technologies.

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Abraham Flanigan and Zoe Falls
Co-Editors-in-Chief, 2017

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Effects of Environment on Depressive Symptoms on Chinese Left-Behind Children

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Abstract

Estimates indicate that about 70 million children in China have been left behind in their hometowns by one or both parents as their parents migrate to other places for work opportunities. However, the potential impact of parental migration on the emotional well-being of left-behind children is still unclear. The purpose of this study was to examine depression levels in Chinese left-behind children and to identify potential risk factors contributing to depressive symptoms in this population. Using a nationally-representative, stratified sample from the China Family Panel Studies (CFPS) database (3019 children, ages 10-15), an HLM model was applied at 1) the child level measuring the influence of family structure and individual-level parenting practices, and 2) the county level estimating the effects of rural vs. urban differences and county-level parenting practices. Cross-level effects between child factors and county factors were also examined. The depressive symptoms were measured by the *Center for Epidemiologic Studies Depression (CES-D, Radloff, 1977)*. Findings indicated that the left-behind children were more likely to report higher scores on depressive symptoms indices than children from intact families. Children reporting more positive parenting practices also tended to have fewer depressive symptoms. The effect of family structures on children's depressive symptoms depended on the county-level parental behaviors. Implications for schools and parenting practices were discussed.

Keywords: depression, left-behind children, parenting practices, China, HLM

Effects of Environment on Depressive Symptoms among Chinese Left-Behind Children

Left-behind children in China is a term used here to refer to children who are under 18 and must live separately from their parents for longer than three months due to labor migration (Zhou & Duan, 2006). Due to urbanization and modernization, millions of Chinese parents leave the countryside and migrate to cities to search for better employment opportunities. Around 261 million people migrated in 2010 and this migration is expected to continue rising in the future (Sixth National Population Census in China, 2011). Many migrant workers are unable to take their children with them to their working places, where migrant workers are typically regarded as unofficial residents and are denied access to local social services such as education, health insurance, and housing allowances. This leads to a large and growing number of children that are left behind in their hometowns (usually in rural areas) by one or both parents. In 2010, about 61 million children are left behind in rural China (The All-China Women's Federation, 2013). After parents migrate to cities, the left-behind children usually live with either a single parent (usually the mother), a grandparent, another guardian (i.e., relative, neighbor, or others), or the child is left alone to care for himself or herself.

Effects of Family Structure on Depression in Chinese Children

Attachment theory suggests that a secure attachment relationship increases children's sense of security and feelings of belonging. Children who felt closer to their parents tended to perform better on measures of psychological adjustment and reported lower levels of depression (e.g., Bowlby, 1973, 1980). Unfortunately, labor migration in China brings about traumatic separations between children and parents-this is likely to cause an interruption to attachment and increase the risk of developing affective disorders that lead to depression (e.g., Bowlby, 1973, 1980). These adverse impacts of family separation are also likely to be especially pronounced in Chinese contexts where Confucian philosophy places a strong emphasis on family belongingness and interrelatedness among family members (Wu & Chao, 2005). Individuals with such family beliefs often place a high value on family cohesion and integrity (Greenberger, Chen, Tally, & Dong, 2000). The break-up of these families in China goes against normative family values and magnifies feelings of abandonment and rejection among left-behind children, which in turn increases their vulnerability to emotional disorders.

However, empirical evidence gathered from Chinese families with left-behind children that examines these premises is inconsistent. Several findings have shown higher depressive symptoms in left-behind children (Chan, 2009; Gao, Wang, Liu, & Wang, 2007; He et al., 2012; Wang et al., 2011). In contrast, others reported negligible differences in depressive symptoms between left-behind children and children in intact families (e.g., Ren & Treiman, 2016; Wen & Lin, 2012). The inconsistencies in these findings may be due to regional samples with potential geographical bias. People from the same area often share similarities in childrearing beliefs and

social resources, but regional groups may show differences from groups in other areas. For example, children within the same geographical region tend to receive similar childrearing beliefs while regional differences exist in how parents interact, discipline, and support their children. Incorporating regional differences (i.e., county of residence) into models should allow examinations of whether links between family structure and children's depression might differ across regions. The purpose of the present study was to use a nationally-representative, hierarchically structured database to compare levels of depressive symptoms in left-behind children with those of children from intact families, and to examine potential effects of regional/county differences.

Parenting Practices and Depression in Chinese Left-Behind Children

An effort to uncover potential effects of being left behind will also need to incorporate an examination of individual differences in parenting behaviors that might have affected parent-child relationships and child outcomes. Evidence suggests a consistent correlation between parenting characteristics and children's depressive experiences (e.g., MacKinnon, Henderson, & Andrews, 1993). Parental rejection (e.g., criticism and indifference), low warmth, and neglect have been found to be associated with higher risk of depression (e.g., Betts, Gullone, & Allen, 2009; Clark & Ladd, 2000). In contrast, children who experienced parental warmth were better able to develop a social confidence that benefits children's well-beings. Positive parenting practice (e.g., warmth, support, and acceptance) could buffer children from adverse experience that might lead to depressive symptoms (e.g., Laible, Carlo, & Raffaelli, 2000).

In China, labor migration has changed the typical family environment and has resulted in more long-term separations between children and parents. Children are often left-behind in hometowns to live with a single parent or grandparents, who tend to have difficulty providing high-quality rearing environments. Remaining caregivers usually face an increased burden of daily life stress, having less time to spend on child rearing or supervision, and they are typically less emotionally supportive of their children than parents in intact families (Amato, 2005). Remaining single parents may also feel more angry toward spouses and become less affectionate toward their children. These familial vulnerabilities could bring detrimental consequences to psychological well-being of both parents and children. Also, children being raised by grandparents, who tend to have lower educational levels and different parenting practices and values relative to birth-parents, may have difficulty getting help with their emotional needs and with their studies. Children cared for by grandparents have a higher likelihood of experiencing less care, malnutrition, mental disorders, and health problems (Duan, et al. 2009; Robson, et al., 2008; Mills, Mills, & Reicks, 2007). An increased risk of child neglect may also occur during parental absences (Gu et al. 2011; Zhong et al. 2012). Migrant parents in long-term family separations often have difficulty maintaining parental care and detecting signs of emotional

stress or disorder in their children. In addition, good Confucian parents are expected to fulfill responsibilities by applying harsh strictness to assure offspring's success. Restrictive supervision from parents (called *guan*, or *to govern*, in Chinese) is usually viewed as care, concern, and responsiveness in Asian cultures (Chao & Tseng, 2002). The lower level of parental involvement for left-behind children may also contribute to children interpreting this as neglect and a lack of care that would tend to decrease self-worth and create more negative self-schema. All of these factors are likely to combine to put Chinese left-behind children at a higher risk for depressive symptoms.

The majority of previous studies regarding emotional development among Chinese left-behind children, however, have focused on the demographic characteristics of parents. Little is known about the potential impact of specific parenting practices in this population. The present study examined whether parenting behaviors were associated with depressive symptoms in a large group of Chinese left-behind children. For these reasons, left-behind children were expected to display higher levels of depressive symptoms than children from intact families.

Rural vs. Urban Differences in Child Depression

In addition to family environment, the broader social environments or communities where children live also have been found to be associated with their emotional development, with rural vs. urban differences being an especially important factor. A large body of evidence has indicated rural vs. urban differences in the prevalence of depression. Findings from Li et al. (2013) demonstrated more severe depressive symptoms among rural children from the Yangzhou, Jiangsu Province in southern China. People living in rural areas are more likely to experience depression compared to urban populations-this has been linked to harsher living conditions and associated stressors (Probst et al., 2006). Left-behind children in rural areas also tend to face increased demands for helping with farmwork or housework, have fewer resources available to support mental health development, and thus have more difficulty coping with their own life stress (Chang, Dong, & MacPhail, 2011). This adverse environment is likely to increase vulnerability for developing depressive symptoms among children in rural areas. Some studies, however, found contradictory results (e.g., Duan, Lu, & Zou, 2013; Wang et al., 2015). Wang et al. (2015) indicated that children in urban areas experienced higher depression than rural children from the Zhengzhou, Henan Province in northern China. Considering the disparity in these findings, incorporating the rural vs. urban differences would yield more useful information for understanding the emotional wellbeing of left-behind children across China.

The Present Study

The present study used Hierarchical Linear Modeling (HLM) in which children were nested within organizational units (i.e., counties), effectively examining whether

county/contextual effects (i.e., between-county effects) accounted for variability above and beyond that attributable to the child-level effects variables (i.e., within-county). Another way of stating this is that the main and interactive effects of family structure (left-behind vs. intact families), parenting practices, and rural vs. urban differences on children's depressive symptoms were estimated at two levels: 1) at the child level, where children's depression scores were regressed on the family structure and child-level parenting practices (individually perceived parenting), and 2) at the county level, where depressive symptom scores were regressed on rural vs. urban differences and county-level parenting practices (county-mean levels of parenting). Interactive effects between factors from both levels were also examined (see Figure 1 for the conceptual model and Appendix A for model equations).

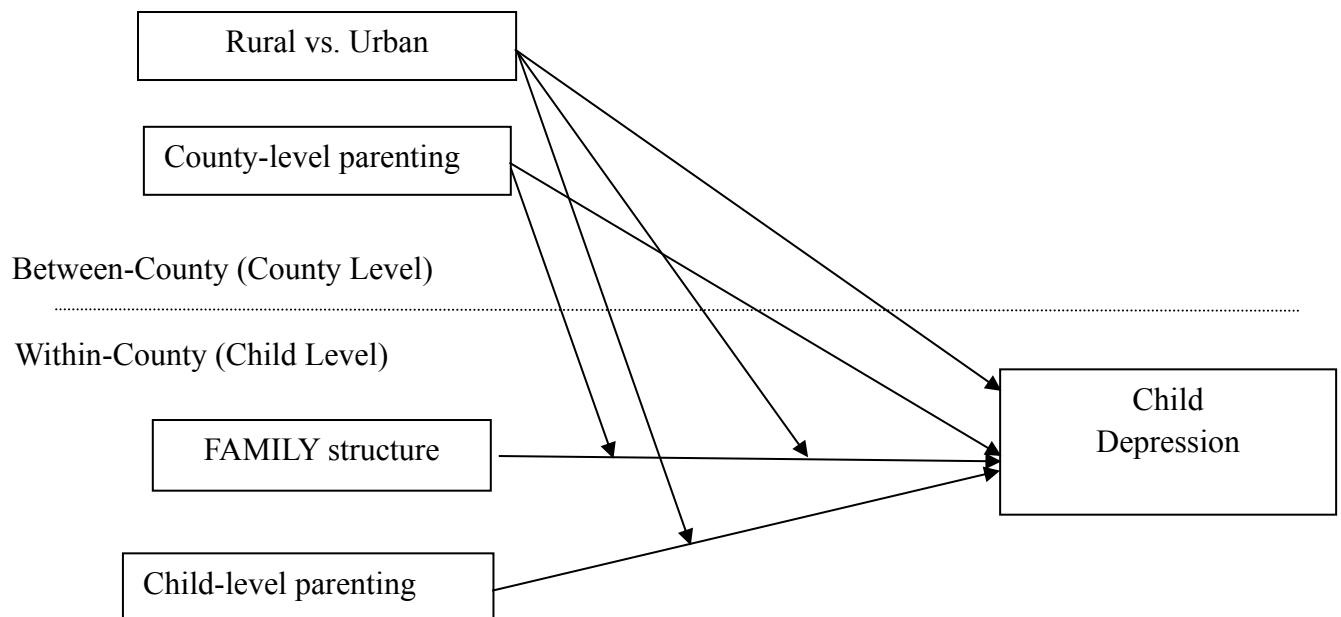


Figure 1. Conceptual HLM of the Impact of Family Structure, Parenting, and Rural vs. Urban Differences on Depressive Symptoms among Chinese Left-Behind Children (for equation details see Appendix A). County-level parenting = the average of parenting scores for each county, FAMILY structure= left-behind children vs. children from intact families, Child-level parenting= individually perceived parenting practices.

Research Questions

1. Did family structure (left-behind vs. intact families) predict children's depressive symptoms? If so, did this relationship vary depending on whether children were living in the rural vs. urban areas?
2. Was parenting practice predictive of children's depressive symptoms? If so, did this relationship vary depending on whether children were living in rural vs. urban areas?
3. Did the relationship of family structure to children's depressive symptoms depend on parenting practice perceived by children?
- 4.

Methods

The CFPS Data Sample

The present study used archival data sources from the China Family Panel Studies (CFPS). CFPS is a nationwide and longitudinal survey of the Chinese families, including 42,590 individuals (8990 children from age 0 to 15 and 33600 adults) from 16,000 households in 25 provinces. Four waves of data collection (2010, 2011, 2012, and 2014) have been carried out thus far. The data used in the present study is the third wave CFPS 2012 in which a total of 43,067 individuals (8,620 children from age 0 to 15 and 34,447 adults) from 13,453 households were included in the sample. All family members age 10 or older answered the questionnaire by themselves in an in-person interview. Information for children younger than age 10 was provided by the primary caregiver of the children. The target population for the present study was children from age 10 to 15. A total of 115 children were excluded because the parental separation is not due to labor migration but other reasons such as divorce, incarceration, or parental death. An additional 16 children were excluded due to no household registration. A total of 3019 children age 10-15 were included in the data analysis (characteristics of sample see appendix B).

Measures

Family Structure. Consistent with previous studies, the present study defined the left-behind children as children who are under 18 and with either both parents or one parent absent (Zhou & Duan, 2006). Children's family structure type was categorized into two types based on their primary caregivers and coded as either: 1) the left-behind children who are either living with only one parent or living with someone other than a parent due to parental labor migration, 2) children in intact families. The family structure was dummy coded as 0= left-behind children and 1=children from intact families.

Rural vs. Urban Contexts. The potential regional or county differences were examined by using a categorical variable for the rural vs. urban counties. A total of 162 counties were

classified into two types of residence areas (rural counties=92, urban counties=70) according to the guidance by the National Bureau of Statistics of the People's Republic of China. The variable of rural vs. urban differences was dummy coded as 0=rural, 1=urban.

Parenting Practices. Parenting practices were measured by 14 items adapted from the *Childrearing without Violence* (2008). Sample items include: "Parents/ guardians liked to talk with you" and "Parents/guardians told stories to you." Children were asked to grade their parents' behaviors based on a five-point Likert scale (1=never, 2=seldom, 3=sometimes, 4=usual, 5=always). Scores for all items are added up to get a sum score ranging from 14 to 70, with the highest score indicates the more supportive and optimal parenting practices. Cronbach's alpha for the scale used in this study was .81 ($M=43.54$, $SD=7.82$).

For the HLM analysis, the parenting practices were examined as a continuous variable at both county-level and child-level. Since the relative position of children with regard to the mean of each group (vs. absolute value) is of interest, Group Mean Centering for child-level variables was applied to produce more accurate and interpretable estimates of the intercepts (Enders & Tofghi, 2007; Raudenbush & Bryk, 2002). Therefore, the county-level parenting practices were computed into county-mean parenting ($MEAN_{parent}$) to estimate the relationship between county-mean scores of parenting practice and children's depressive scores. The child-level parenting practices were computed as center-within-county parenting (CWC_{parent}) estimating the relationship between individual parenting perceptions and children's depressive symptoms.

Depression in Children. The depressive symptoms of children were measured by a 20-item scale of the *Center for Epidemiologic Studies Depression (CES-D)* (Radloff, 1977). The *CES-D* has been widely applied in western studies (e.g., Guarnaccia, Angel, & Worobey, 1989). The Chinese version used here was developed and validated in studies of Chinese adolescents (Chen, Yang, & Li, 2009). Participants were asked to rate their feelings in the past week on a 4-point Likert scale indicating 1= rarely or none of the time (less than 1 day), 2= some or a little of the time (1-2 days), 3= 3 occasionally or a moderate amount of time (3-4 days), 4= all of the time (5-7 days). The *CES-D* has four factors: somatic symptoms (e.g., "My sleep was restless"), depressed affect (e.g., "I felt depressed"), positive affect (e.g., "I enjoyed life"), and interpersonal problems (e.g., "people were unfriendly"). All items are added to produce a total score. Cronbach's alpha for the scale used in this study was .85 ($M=31.58$, $SD=6.56$).

Data Analysis

SPSS 23.0 was used for descriptive analysis of all variables. The one-way ANOVA tests were used to test score differences for children's depressive symptoms among six age groups. The t-tests were applied to assess differences in children's depressive symptoms by rural vs. urban differences, gender, and family structure. Initial correlational analyses were used to test relationships between demographic variables and children's depressive symptoms indices. Non-

significant variables were excluded from subsequent regression analyses. The HLM was estimated in SAS 9.4 to examine both the contribution of child-level factors (family structure and child-level parenting) and county-level factors (rural vs. urban differences and county-level parenting) to children's depressive symptoms. A typical four-step approach was used to construct the model in which unconditional effects were tested at Step 1; The child-level main effects of family structure and child-level parenting were examined at Step 2; The county-level main effects of rural vs. urban differences and county-level parenting were estimated at Step 3; Finally, interactions between both level predictors were assessed simultaneously (Hofmann, 1997; Raudenbush & Bryk, 2002; Woltman, Feldstain, MacKay & Rocchi, 2012) (equation details see Appendix A).

Results

Results for Depression

Table 1 presents descriptive statistics on children's depression scores by age, gender, family structure, and rural vs. urban differences. The t-tests indicated a significant difference in the scores for children's depressive symptoms between rural and urban areas ($t(2551) = 6.15, p < .0001$). Children in rural areas reported higher scores in depressive symptoms ($M = 32.03, SD = 6.58$) than children in urban areas ($M = 30.09, SD = 6.39$). Similarly, left-behind children reported higher scores on depressive symptoms indices than children from intact families ($t(2557) = 1.92, p < .0001$). There was no significant difference in scores for children's depressive symptoms between genders ($t(2644) = 1.16, p = .244$) or children's depression scores among six age groups in a one-way ANOVA test ($F(5, 2644) = 1.36, p = .24$).

Table 1

Descriptive Statistics for Children's Depressive Symptoms by Age, Gender, Family Structure, Rural vs. Urban Differences

		Depressive Symptoms	
		<i>Mean</i>	<i>SD</i>
Age	10	31.69	6.74
	11	32.24	6.55
	12	30.76	6.50
	13	31.70	6.82
	14	31.37	6.03
	15	31.77	6.62
Gender	Male	31.42	6.54
	Female	31.72	6.58
Family Structure	Left behind	33.66	6.69
	Intact family	31.61	6.52
Rural vs. Urban	Rural	32.03	6.58
	Urban	30.09	6.39

Results for HLM

Initial correlational analyses demonstrated that demographic variables such as age and gender were not significantly associated with children's depressive symptoms indices. Accordingly, these variables were eliminated from subsequent regression analyses. The HLM design was preferred because this model takes into account potential shared variances nested within a higher-level unit (Raudenbush & Bryk, 2002). Children who are nested within the same county unit are more likely to share variability due to common impacts from higher-level variables (e.g., childrearing beliefs and educational resources). If a county places a high value on parenting practices, then this would affect the emotional development of all children living in the same county. When analyzing the effects of higher-level predictors on children-level variables, HLM takes into account the fact that there are correlated effects (e.g., higher-level influences and error terms) among children from the same county (Vitale, 2008).

A typical four-step approach was used to construct the model (Hofmann, 1997; Raudenbush & Bryk, 2002; Woltman et al., 2012). In Step 1, the analyses used a fully

unconditional model to estimate the *Intraclass Correlation Coefficient (ICC)*, indicating a significant amount of variability in the depression scores that are attributed to county-level groupings (Raudenbush & Bryk, 2002). Given the significant effects of clustering between children within the same county ($ICC=.18 > 5\%$), an HLM was needed to test the county-level effects (Bliese, 2000). The restricted maximum likelihood (REML) estimation and SAS PROC MIXED was used in the data analysis.

In the following steps of HLM analyses, a sequence of nested models was tested to compare the fit of models based on -2 Res Log Likelihood (-2RLL), Akaike information criterion (AIC), and the Bayesian information criterion (BIC) (Hofmann, 1997; Raudenbush & Bryk, 2002; Woltman et al., 2012). Specifically, child-level variables (i.e., family structure, child-level parenting) were entered subsequently to Step 2; County-level variables (i.e., rural vs. urban, county-level parenting) were entered subsequently to Step 3. In the final model, predictors for both levels were added together to test cross-level effects in Step 4. The best model for this data was selected out with significant log likelihood difference and the smallest magnitude of fit indices as -2RLL=8398.8, AIC=8412.8, BIC=8434.4 (see Table 2).

Table 2

Model Fit Indices

Four-step Models with predictors		-2 RLL	AIC	BIC
Step 1	Unconditional model			
Step 2	FAMILY	8963.1	9631.5	11552.1
	Child-level parenting	8900.3	1021.6	19915.2
	FAMILY, Child-level parenting	8414.1	8428.4	18449.6
Step 3	Rural vs. urban	16618.7	16622.7	12662.9
	County-level parenting	16707.6	16713.1	16729.4
	Rural vs. urban, County-level parenting	9957.2	8861.2	9899.3
Step 4	FAMILY, Rural vs. urban	8398.8	8412.8	8434.4
	County-level parenting, Child-level parenting			

Note. FAMILY= Family structure (left-behind children vs. children from intact families), child-level parenting= center-within-county parenting (individually perceived parenting practices), rural vs. urban= rural vs. urban differences (0=rural, 1=urban), County-level parenting =county-mean parenting practices (the averages of parenting scores for each county).

As can be seen in Table 3, the results of the HLM on children's depression scores indicate that there were three statistically significant predictors. At the child level, left-behind children were significantly related to higher depression scores ($b=-4.17$, $t = 2.04$, $p<.05$) after holding constant other predictors (rural vs. urban differences, child-level parenting, county-level parenting). The effect of more supportive parenting practices perceived by individuals was negatively related to children's depressive symptoms after controlling for the family structure and all county-level variables ($b=-.19$, $t = -3.51$, $p<.001$). Both of the county level factors (rural vs. urban differences and county-level parenting) did not display a significant main effect on children's depressive symptoms. Moreover, the cross-level analysis indicated that being left-behind was significantly related to higher depressive symptoms even when the county-level parenting practices were more supportive ($b=-.09$, $t = -1.92$, $p<.05$).

Table 3

Results of HLM on Children's Depression Scores

Levels	Variable s	Estimate	S.E.	df	t
Child Level	FAMILY, γ_{10}	-4.17*	2.04	1126	2.04
	Child-level parenting, γ_{20}	-0.19**	0.05	1126	-3.51
County Level	Rural vs. urban, γ_{01}	-0.59	0.45	1126	-1.30
	County-level parenting, γ_{02}	-0.11	0.09	158	-1.15
	FAMILY* rural vs. urban, γ_{11}	0.10	0.25	1126	0.40
Interactions	FAMILY* County-level parenting, γ_{12}	-0.09*	0.05	1126	-1.92
	Rural vs. urban *Child-level parenting, γ_{21}	-0.02	0.03	1126	-0.49

Note. * $p < .05$. ** $p < .001$. FAMILY=family structure (left-behind children=0, children from intact families=1). Child-level parenting = center-within-county parenting practice. County-level parenting = county-mean-parenting practice. Rural vs. urban= rural vs. urban differences (0=rural, 1=urban). -2RLL=8398.8, AIC=8412.8, BIC=8434.4.

Considering the significant effects of FAMILY*County-level parenting on children's depressive symptoms, a follow-up test of the intercept and slope was further examined for children from different family structures. There was a significant effect of county-level parenting for intact-family children on depression scores but no significant effects for left-behind children. Results are consistent with our assertion that children from intact families benefit from living in a county with a high average value of supportive parenting and tend to display a .20 unit decrease in depression scores, whereas left-behind children appear to gain little from county-level positive parenting practices (see Table 4).

Table 4

The Regression Parameters for Family Structure

Label	Estimate	S.E.	df	t
Intercept for FAMILY	32.01	0.06	1126	-2.15
Intercept for INTACT	31.13	0.08	1126	-4.05
Slope for LEFT	-0.11	0.09	1126	-1.25
Slope for INTACT	-0.20***	0.07	1126	-3.08

Note. *** $p < .001$. LEFT= left-behind children. INTACT=intact family children.

Discussion

The present study examined the relationship among family structure (left-behind children vs. intact family children), parenting practices, rural vs. urban differences, and children's depressive symptoms in a nationally-representative Chinese child/early adolescent population. Because we detected a significant difference in children's depressive symptoms among 162 Chinese counties (rural counties=92, urban counties=70) and the nested variability among children living within the same county, HLM was applied to examine these effects at two levels. Three important findings have emerged from the present study. Left-behind children reported higher scores on depressive symptoms indices than children from intact families. Second, results indicated children reporting more positive parenting practices tended to have fewer depressive symptoms. In addition, the impact of family structure on children's depressive symptoms depends on county-level parenting practices; that is, intact family children with more supportive parenting practices reported a lower level of depression scores.

Family Structure and Children's Depressive Symptoms

The present study indicated that left-behind children were more likely to report a higher level of depressive symptoms than children from intact families. This result answered our first research question that prompted this project: does family structure (left-behind vs. intact families) affect children's depressive symptoms? Our findings supported evidence from previous Chinese family studies (e.g., Liu, Li, & Ge, 2009; He et al. 2012; Ren & Treiman, 2016; Wang et al. 2011) that suggested that this is the case. Because they are separated from parents for long periods, left-behind children are less likely to obtain support for dealing with their emotional disturbances and stressors. Left-behind children likely have a sense of being abandoned and rejected by their parents, and this may result in a low sense of self-worth and increase the risk of

depression (Ren & Treiman, 2016). In addition, our findings indicated that the relationship between family separation and children's depressive symptoms did not appear to depend on whether the county is rural or urban. One possible explanation is that emotional needs for family integrity are universal for children across different socioeconomic statuses.

In considering these negative effects of family separation on children's emotional development, future studies should examine whether or not left-behind children might benefit from policies for improving access to education and health care (especially mental health services). Findings from the present study may also have implications for school administrators. Giving the potential disorders in emotional development for left-behind children, schools may be able to provide them with counseling services. Improving mental health support and reducing social discrimination against left-behind children would help them better adjust to the school environment (Ren & Treiman, 2016). School administrators who provide a more supportive environment for left-behind children may also see benefits in student mental health and academic performance. Left-behind children might be able to use school personnel as attachment figures and perhaps the school context as a more effective secure base for children to explore academic activities and interpersonal relationships. Improving the school-parent communication and support is probably another good way to reduce the risks related to being left behind.

Parenting Practice and Children's Depressive Symptoms

The significant relationship between child-level parenting practices and depressive symptoms suggested that positive parenting practices were also related to lower scores for depressive symptoms. Findings for the second research question are also consistent with a critical role that we hypothesized for parenting practices in children's emotional development. Children with more positive parental behaviors were less likely to have depressive symptoms, whereas children with less caring parents tended to have a higher level of depressive symptoms. Results are consistent with western literature findings regarding parenting practices effects on children's depressive symptoms (Garber, Robinson, & Valentiner, 1997; Walker, Garber, & Greene, 1993). Authoritative parenting styles, characterized by high levels of warmth, support, acceptance, and encouragement of autonomy would typically provide children with more positive views about themselves and the world, which in turn has been associated with a decrease of the emergence of children's depressive symptoms (Baumrind, 1978). This finding has important implications for parents' facilitation of children's emotional development in China. For example, future studies can examine whether or not parents can spend more time with children on playing and reading books together see a benefit in the mental health of their children. Encouraging children to express their thoughts might be another good way to foster a positive sense of self-worth. When children do something wrong, parents can ask reasons and discuss how to make things correct.

Moreover, findings indicated that county-level parenting practices moderated the relationship between family structure and children's depressive symptoms. This result answered our third research question that examined links to family structure and asked whether children's depressive symptoms depend on perceived parenting by children. Children from intact families reported fewer depressive symptoms when they perceived their parents as having more positive parenting practices. Left-behind children's depressive symptoms were not impacted by their assessment of their parents' behaviors. One possible explanation is that children from intact families are more likely to experience positive impacts such as positive educational values, roles modeling, and social skills from their parents. On the other hand, the children who are left behind in local areas appear less likely to obtain warmth and support from parents. The unavailability of parental care throughout child development is the biggest challenge for left-behind children, especially when they need parental support for handling stressors or life challenges. One implication is that it will be important to examine how families can facilitate intimacy between left-behind children and their parents. Phones or video-conferencing, for example, might be effective ways to maintain long-distance communication that fosters emotional support. By using phones, left-behind children can talk to parents regularly, exchanging their feelings and obtaining affections from parents (Pan et al., 2013).

Limitations

There are several limitations of this study, indicating several directions for future research. First, the emotional development of these migrant children prior to their parents' migration was not known – this would allow for an examination of change in development perhaps attributable to being left behind. A further study that distinguishes the children left behind in hometowns (i.e., more familiar contexts) and children who migrate with parents to other places would also allow a comparison of emotional development in these groups. Second, the present study followed the practice in previous studies of combining children with both parents absent and children with only one parent absent. However, it is reasonable to assume that after the migration, one less parent at home would lead to a different effect on childrearing and child psychological wellbeing compared to families where both parents migrate. For example, if only one parent was working and that parent migrated, then sent back money, while the remaining parent stayed at home as before, that wouldn't be likely to have the same effect. Similarly, if both parents were working before the migration of one of them, and the remaining parent worked the same job/hours as before, then the parenting situation may not have changed as much. It will be necessary to distinguish between children who have been left by only one parent vs. both parents. Accordingly, it is important that future studies could examine the emotional development of those two groups separately. Finally, findings in the present study

were obtained from a cross-sectional design using the third wave data collected in CFPS 2012. In future research, longitudinal analyses could be able to provide greater support for causal linkages among the family structure, parenting practices, and children's depressive symptoms.

Conclusion

This study used archival data from CFPS 2012 to examine the main and interactive effects of family structure, parenting practices, and rural vs. urban differences on depressive symptoms among Chinese children in an HLM model. Results confirmed our predictions that the main effects of family structure, individually perceived parenting, as well as interactive effects between county-mean parenting and family structure all contributed to the level of depressive symptoms in Chinese children. At the child level, left-behind children were more likely to report a higher level of depressive symptoms than children from intact families. Children with more positive parenting practices also tended to have fewer depressive symptoms. No significant effects from county-level factors were found. The effect of county-level parental behaviors did, however, moderate effects of family structure on children's depressive symptoms. Identifying the depression levels in left-behind children and examining potential factors associated with these depressive symptoms is a first step for developing further interventions to improve mental health for this vulnerable child population. Those planning programs to reduce emotional disorders in Chinese left-behind children would benefit from a better understanding of the role of family structure, parenting practices, and rural vs. urban differences. In addition, exploring the contribution of family variables to depressive symptoms among Chinese left-behind children in a family-centered culture would further our understanding of child development in different cultural contexts.

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Appendix A. Model Equation

An HLM model was estimated in SAS 9.4 to evaluate the effect of rural vs. urban differences and county-level parenting (county-mean parenting, *MEANparent*) at county level and the effect of family structure and child-level parenting (center-within-county parenting, *CWCparent*) at the children level in terms of children's depression score. The variable of rural vs. urban differences and the family structure were dummy coded with reference groups corresponding to rural areas and left-behind children. The *MEANparent* and *CWCparent* were entered as continuous variables.

$$Y_{ij} = \beta_{0j} + \beta_{1j} \text{FAMILY} + \beta_{2j} \text{CWCparent} + \beta_{3j} \text{Gender} + \beta_{4j} \text{Age} + r_{ij} \quad \text{Level 1}$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01} \text{URBAN}_j + \gamma_{02} \text{MEANparent} + u_{0j} \quad \text{Level 2}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} \text{URBAN}_j + \gamma_{12} \text{MEANparent} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21} \text{URBAN}_j + u_{2j}$$

then

$$Y_{ij} = \gamma_{00} + \gamma_{01} \text{URBAN}_j + \gamma_{02} \text{MEANparent} + \gamma_{10} \text{FAMILY} + \gamma_{20} \text{CWCparent} + \gamma_{11} \text{URBAN}_j * \text{FAMILY} + \gamma_{12} \text{MEANparent} * \text{FAMILY} + \gamma_{21} \text{URBAN}_j * \text{CWCparent} + u_{0j} + u_{1j} \text{FAMILY} + u_{2j} \text{CWCparent} + r_{ij}$$

where center-within-county $\text{CWCparent} = \text{PARENT}_{ij} - \overline{\text{PARENT}_j}$

$$r_{ij} \sim N(0, \sigma^2) \text{ and } \begin{pmatrix} u_{0j} \\ u_{1j} \\ u_{2j} \end{pmatrix} \sim MVN \left[\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \tau_{00} & \tau_{01} & \tau_{02} \\ \tau_{10} & \tau_{11} & \tau_{12} \\ \tau_{20} & \tau_{21} & \tau_{22} \end{pmatrix} \right]$$

Y_{ij} is the depression for the i^{th} child within the j^{th} county.

γ_{00} is the grand mean of the children's depression.

γ_{01} is the rural vs. urban effect on the mean of children's depression.

γ_{02} is the effect of county-level-parenting mean on the mean of children's depression.

γ_{10} represents the expected family-depression slope in a county with rural vs. urban differences = 0 and $\text{MEANparent} = 0$.

γ_{11} is the rural vs. urban effect on the family-depression slope.

γ_{12} is the *MEANparent* effect on the family-depression slope.

γ_{20} represents the expected *CWCparent*-depression slope in a county with rural vs. urban differences = 0 and $\text{MEANparent} = 0$.

γ_{21} represents the rural vs. urban effect on the *CWCparent*-depression slope.

u_{0j} is the random rural vs. urban and *MEANparent* effect on the mean of depression.

u_{1j} is the random rural vs. urban and *MEANparent* effect for the *CWCparent*-depression slope.

u_{2j} is the random rural vs. urban effect for the CWC parent-depression slope.

r_{ij} the residual for the i^{th} child within the j^{th} county.

τ_{00} represents the variance among county *depression* means, after controlling for rural vs. urban differences and $MEAN$ parent.

τ_{11} represents the variance among county FAMILY-depression slopes, after controlling for rural vs. urban differences and $MEAN$ parent.

τ_{22} represents the variance among county CWC parent-depression slopes, after controlling for the rural vs. urban differences.

Appendix B. Characteristics of the Sample

		Male		Female		TOTAL	
		N	%	N	%	N	%
Age	10	274	17.3	225	15.7	499	16.5
	11	248	15.6	209	14.6	457	15.1
	12	245	15.5	259	18.1	504	16.7
	13	301	19.0	241	16.8	542	18.0
	14	258	16.3	234	16.3	492	16.3
	15	259	16.3	266	18.5	525	17.4
	Total	1585	100	1434	100	3019	100
School levels	Elementary	978	61.7	832	58.0	1810	60
	Middle school	568	35.8	557	38.9	1125	37.3
	High school	39	2.5	45	3.1	84	2.8
	Total	1585	100	1434	100	3019	100
Rural vs.	Urban	300	19.7	285	20.8	585	20.2
Urban	Rural	1220	80.3	1088	79.2	2308	79.8
	Total	1520	100	1373	100	2893	100
Family Structure	Left-behind children	602	39.8	555	39.9	1157	39.8
	Intact families	912	60.2	835	60.1	1747	60.2
	Total	1514	100	1390	100	2904	100

Students on the Edge: Evaluating an Academic Support Group

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Abstract

This qualitative case study evaluated the effectiveness of the Academic Skills Discussion Group, a new retention intervention targeting undergraduate students on academic probation. This intervention utilized a support group structure to provide social and academic supports to academically-poor students. These supports incorporated didactic educational presentations and interpersonal discussions relating to life change and college expectations. The case comprised one pilot administration of the intervention for three student group members. Data was collected from pre/post-intervention resiliency surveys, grade point average comparisons, journal-entry analysis and semi-structured exit interviews. The researcher conducted inductive data analysis by coding participant statements for meaning, calculating and comparing survey results, and triangulating findings. Analysis provided case descriptions and themes regarding how participating in the intervention influenced students' resiliency, adjustment, and academic performance. Findings indicate that for most students, participation in the program coincided with improved academic performance and increased connectivity to the academic environment. Evaluative descriptions break down the recruitment strategy, examine benefits of participation and address future enhancements to the delivery of the intervention. Implications for higher education applications and future use of small group interventions are discussed.

Keywords: higher education, case study, academic probation, retention, support group

According to the U.S. Department of Education National Center for Educational Statistics (2001), access to higher education has increased due to an increase in scholarship programs funding undergraduate education. More academically at-risk undergraduate students are attending college across the country. Increased at-risk student populations include: first-generation students, those from lower-income families, students from a variety of underrepresented racial and ethnic minorities, and those that attended rural or urban schools with limited resources (Schultz, 2004; Stuber, 2011; Thering, 2011). Since at-risk students are often not academically prepared, they struggle, feel like they do not belong, become marginalized, and drop out or are dismissed (Forbus, Newbold & Mehta, 2011; Heinisch, 2016; Schultz, 2004). Higher education institutions are seeing increases in total undergraduate enrollment, but corresponding graduation rates are diminishing at an alarming rate indicating students' lower overall success rates (Talbert, 2012).

Before dropping out or being dismissed, unprepared students often find themselves on academic probation. In many cases, students are placed on Probation Level-1 when their semester or cumulative grade point average (GPA) falls below 2.0. When a student fails to raise their GPA high enough to remove themselves from probation after one semester, they are placed on Probation Level-2. At this point, if they do not improve their semester or cumulative GPA to above 2.0, they will be dismissed from the institution. The Probation Level-2 students are at risk of being dismissed and it appears their Probation Level-1 efforts did not work for them. In some cases, students may be demoralized, lack motivation, and need additional help. These students may benefit from supportive interventions that specifically cater to their situation providing them another chance to avoid dismissal.

Although many colleges and universities employ retention interventions (Bellman, Burgstaher & Hinke, 2015; Clark & Cundiff, 2011; Grier-Reed, 2013), with the increasing number of academically at-risk students, an intervention was needed that targeted Probation Level-2 students. Many of the existing retention interventions focused on either one-on-one interactions between students and advisors (Bellman et al., 2015), or large seminar classes that provided little individual attention (Clark & Cundiff, 2011). Many Probation-Level 2 students have already experienced these types of interventions with little success and their continued struggles indicate that they might benefit from a different type of intervention. This precipitated the design of the Academic Skills Discussion Group.

Psychological research and practice in group therapy justifies the benefits of a facilitator working with group members to promote a supportive environment for growth and change (Corey, Corey & Corey, 2010; Johnson & Johnson, 1982; Yalom, 2005). Although not technically group therapy, participants of the intervention benefit similarly by being kept accountable by other group members and using other students' stories to gain perspective on their own situation.

It is important for colleges and universities to build connections between students and their college resources and develop a college-wide community of support (Tinto, 2006). One-on-one interventions are fine, but utilizing tenets of group therapy can provide a communal process where students learn to lean on each other, which in turn, helps them recognize how they can succeed in college. Research in therapeutic disciplines and higher education practices support this idea (Corey et al., 2010; Johnson & Johnson, 1982; Yalom, 2005), but few programs like the Academic Skills Discussion Group have been developed and assessed thoroughly. Other probation recovery programs utilize stand-alone workshops and one-on-one advisor meetings. The Academic Skills Discussion Group supports students by promoting connectedness and peer-to-peer networking and provides multiple opportunities for academic skills discussions and relationship-building.

Undergraduate students and higher education professionals alike benefit from retention interventions for academically distressed students. Therefore, it is imperative to evaluate the effectiveness of the Academic Skills Discussion Group intervention to determine whether it justifies the resources needed to offer it campus-wide. Due to the novelty and complexity of the experiential intervention being studied, an inductive, qualitative approach is necessary.

Purpose Statement

The purpose of this case study was to compare participant experiences to better understand the effectiveness of the Academic Skills Discussion Group retention intervention for students on Probation Level-2. I have collected multiple forms of data and have chosen to conceptualize this research as a case study (Creswell, 2013). This case included the experiences of Probation Level-2 students participating in the Academic Skills Discussion group administered fall of 2015. The following questions guided the research:

1. What is the experience like for students participating in the Academic Skills Discussion Group?
2. How are students experiencing the components of the program? (check-in/out, topical discussions, student-to-student interactions, and journaling)
3. How does participating in the intervention coincide with students' semester and cumulative GPA?
4. How does participating influence a student's self-reported resilience/adjustment?
5. What elements of the program promote student success?

Literature Review

Persistence and student retention are two widely explored areas of postsecondary education (Tinto, 2006). Several theories of persistence include social factors implicating the importance of students bonding with their institution (Barbatis, 2010; Fowler & Boylan, 2010). Tinto (1997) indicated that a student's inability to break away from friends and family, failure to understand the role of a college student, and failure to bond with the institution both socially and academically contributed to drop-out rates. These tenets of persistence drive the development of retention programs in higher education with a variety of at-risk student populations including: African-American students (Brooks, Jones, & Burt, 2013; Grier-Reed, 2013), students with disabilities (Bellman et al., 2015), first-generation students (Wibrowski, Matthews & Kitsantas, 2016), students attending community colleges (Barbatis, 2010; Nitecki, 2011), first-year students transitioning to college (Clark & Cundiff, 2011; Mattanah et al., 2010; Tinto, 1997), and academically poor students requiring developmental education (Fowler & Boylan, 2010; Laskey & Hetzel, 2011; Valentine et al., 2011). Many recent retention interventions have been implemented with a variety of programmatic structures. Variations include: open-forum informal discussion groups (Grier-Reed, 2010), first-year learning communities (Barbatis, 2010; Tinto, 1997), academic coaching sessions (Bellman et al., 2015), semester-long freshman seminars (Clark & Cundiff, 2011), and peer-led social-support groups (Mattanah et al., 2010).

Social Support

One consistent finding that supports the need for the current study is the importance of helping students connect to their institution. A sense of belonging and connectedness is one of the most important tenets of retention (Strayhorn, 2012). As a result, most retention interventions contain elements of mentoring and community support (Wibrowski et al., 2016). Tinto (1997) found that classrooms could be used to promote connectedness and serve as an intersection point for faculty and student communities to come together. When students felt like a member within the classroom community, that feeling extended to the external academic community as well. Social supports utilizing listening, questioning, reflection, and empathy have been found to be important aspects in retention interventions (Bellman et al., 2015).

There is a precedent for implementing first-year seminars, service learning, and learning communities to promote social integration for students (Clark & Cundiff, 2011). Grier-Reed (2013) studied an informal social group and findings illustrated how an environment for student support and encouragement generated therapeutic and academic benefits. Barbatis (2010) examined persistence factors in underprepared community college students. The author found that for students to succeed, colleges should provide opportunities for social involvement both inside and outside of the classroom. Mattanah et al. (2010) reported that peer-to-peer

interactions led to participants experiencing higher levels of perceived social support and reduced loneliness at a large university.

Program Evaluation

Many researchers have utilized case studies to examine the effectiveness of retention interventions in higher education (Barbatis, 2010; Bellman et al., 2015; Nitecki, 2011; Tinto, 1997). Barbatis (2010) interviewed 22 participants and observed them in focus groups to learn about what contributed to student persistence. Bellman et al. (2015) administered a survey to 41 students with disabilities pursuing science education. Their measure utilized open-ended questions intended to provide feedback on an academic coaching intervention. Nitecki (2011) used document analysis, faculty and student interviews, and classroom observations to study two cases of successful academic programs in an urban community college. Findings indicated that these programs were successful because they built a program culture, handled advising well, and connected their curriculum to student career goals.

Researchers have also incorporated quantitative assessment data by comparing GPA and grades before and after an intervention (Fowler & Boylan, 2010). Others have collected data relating to personality variables, GPA, ACT scores, use of tutoring services, high school profile, and demographic information (Laskey & Hetzel, 2011). Quantitative scales measuring self-regulation and motivational beliefs during a student's freshman year have found that participants had higher levels of motivation, study skills, and higher academic gains overall (Wibrowski et al., 2016).

Assessment Gaps

Tinto (2006) noted that institutional action, promoting success of low-income students, and program implementation are areas of research and practice needed in higher education. Tinto indicated, "We need research that sheds light on the types of program and institutional practices that lead to successful implementation of programs and do so in ways that ensure that they endure over time" (p. 10). Valentine et al. (2011) reviewed studies evaluating retention programs and discovered that there is a need for rigorous studies examining interactions between programs and student characteristics to determine what programs are effective for which students. This study aims to address these gaps by collecting qualitative data to produce in-depth descriptions of students, their unique characteristics, and how each student interacted with and experienced the various components of the retention program and its implementation.

Description of the Intervention

Below is a brief description of the Academic Skills Discussion Group intervention.

Goal

The goal is to provide a high-impact intervention with an environment of inclusion, community, and connectedness so students on academic probation can develop academic skills, make deeper connections with other students, get exposure to on-campus resources, share about their experiences, and receive support from peers and facilitators.

Method of Delivery

Students placed on academic Probation Level-2 receive an email notifying them of the intervention and inviting them to participate. A reminder email follows and finally a personal phone call is placed to every potential group member encouraging them to participate.

For this case, three students responded and gathered as a group to meet weekly with a facilitator for six weeks at 60 minutes per session. An additional week was included for student debriefing and exit interviews. During the sessions students discussed issues related to their academic progress and college experience. Topics varied depending on the participants' needs. The facilitator encouraged each member to check-in at the beginning of each session and check-out at the end, engaged members in discussions, and welcomed student-to-student responses to issues as they arose. The last 10 minutes of each session was spent with members writing responses to questions posed by the facilitator. The facilitator reviewed the responses and utilized these as a catalyst for discussion the following week.

Facilitator Role

In addition to recruiting group participants, the role of the facilitator is generally to provide a structure to the sessions. The facilitator leads topical discussions, mediates student check-ins/outs, facilitates student-to-student conversations, and provides questions for students to consider while journaling. The facilitator also prepares back-up topics in case students need additional academic information they might not get elsewhere.

Intended Outcomes

The intervention has several intended outcomes. One is to integrate student study skills, didactic education, and discussions on academic progress through group-directed learning. Another is to retain these individuals as students in-part through social supports and connectivity. Finding commonalities among peers allows group members to normalize their own student experiences, and the facilitator and senior members act as guides to student success. Finally,

sharing in a social context provides powerful first-person accounts, keeping students accountable, and helping them develop social skills.

Methods

Case Study Approach

Since the intervention is intended to be a personal experience for students, it was important to evaluate the intervention with detailed accounts of their experiences. With few participants, there was an opportunity to gather data that could assess the program using thick, rich, descriptions of the individuals' experience through collaboration and meaning making. Therefore, a qualitative case study approach was chosen "...in which the investigator explores a real-life, contemporary bounded system or multiple bounded systems over time, through detailed, in-depth data collection involving multiple sources of information...and reports a case description and case themes" (Creswell, 2013, p. 97). The case being studied here includes the intervention approach and experiences of participants in the Academic Skills Discussion group administered in the fall of 2015.

Data was collected during and after the administration of the intervention. Findings were analyzed within and across participants and synthesized into case descriptions and themes providing detailed, specific data about the students' experiences and their recommendations for the future of the intervention.

Sample Selection Procedures

I employed purposeful sampling to identify participants that best fit the research goals. I used criterion sampling to specifically select participants who were students from the same college at a large Midwestern university, were placed on academic Probation Level-2, and were participating in the Academic Skills Discussion Group. Although not required, each group member that participated in the intervention also volunteered to participate in the assessment/research component as well. Participants included one female and two males of varying academic status. See Table 1 for a summary of pertinent participant characteristics.

Table 1

Student Participant Characteristics

	Henry	Jessica	Mark
Gender	Male	Female	Male
Age	32	20	20
Academic Status	Senior non-traditional student	Junior	Junior
Identified Reasons for Probation	-Difficulty focusing in class -Problems with academic follow-through -Lack of local support system	-Lack of motivation -Difficulties with science courses -Disconnected from academic environment	-Lack of study skills -Unsure about major -Not utilizing supporting resources

The context for the intervention and data collection included a conference room on university property that was chosen for its convenience for students and was used with permission from the college. The group met every consecutive Wednesday at 4:00pm. This consistent site location and meeting time contributed to environmental continuity within and across the case.

Researcher/Facilitator Positionality

I played a dual role as both the facilitator and the primary researcher. To protect the integrity of this study, it is important to recognize my position and to utilize reflexivity to reflect critically on my roles (Merriam, 2009). As a counselor, I have experience facilitating support group therapy sessions. I believe that in order to understand a group member, one must recognize that reality is subjective. Therefore, my worldview is interpretive/constructivist described by Neuman (2011) as one that “emphasizes meaningful social action, socially constructed meaning, and value relativism” (p. 101). As an academic advisor, I have many conversations with students about academic issues. I am intimately familiar with the policies regarding academic probation. I have not personally been on academic probation; however, I have been a student member of an academic support group. To most accurately represent the participants’ realities, I attempted to bracket my own perspective during data collection, analysis, and interpretation.

Data Collection Methods

Students were invited to participate in an academic probation intervention that occurred regardless of whether they chose to participate in the research. In this case, all students participating in the intervention also chose to participate in the study. Data was collected from pre/post surveys, student journal entries, exit interviews, and the student information system (GPA). Content of the session discussions was not used as data for the evaluation. While this was a qualitative study, some quantitative data (resiliency surveys and student GPA) was also collected to provide context for the case description and interpretation.

Pre/Post measures. To examine how resiliency was affected before and after the intervention, an exploratory survey developed by the university's Office of Academic Affairs to measure first-generation student experience was re-purposed and administered before and after the probation intervention. This survey utilized three different scales. The first 8 items used a 5-point Likert scale ranging from "Very much like me" to "Not like me at all" and allowed participants to self-report their levels of resilience/grit. Another 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree" measured engagement/academic motivation (7 items), self-efficacy/aptitude (7 items), time management (7 items), and inclusion in the campus community (6 items). For the final 12 items, participants indicated either "Yes" or "No" regarding their use of campus resources.

Journals. The journaling process allowed participants to reflect on their experiences and growth during the intervention. The content of the journals was utilized during sessions as a catalyst for group discussions. The journals also provided archival records of participant observation and were used to supplement and triangulate the other data collected in order to provide a comprehensive description of student experience (Creswell, 2013).

Exit interviews. Individual exit interviews with each participant were conducted one week after the final group session. Each interview contained twelve open-ended, semi-structured questions to provide adequate guidance for the interviewer while allowing participant flexibility and elaboration during administration. These interviews were audio recorded for later transcription and analysis. The questions for the semi-structured interview (see Table 2) were designed to address the research questions regarding overall student experience, positive and negative aspects of the group, and suggestions for future groups.

Table 2

Academic Skills Discussion Group Exit Interview Protocol

How do you think you've changed since coming to this group?
What habits introduced in the program do you think you'll continue on your own?
What were the most valuable aspects of the Academic Skills Discussion Group?
What were the least valuable aspects of the Academic Skills Discussion Group?
Tell me your reactions to the reflective journaling process. Was that a valuable experience?
Why or why not?
How can the group be improved in the future?
What did you think of the recruitment methods for this group? Any suggestions for future groups?
What are your thoughts on the duration of the program?
This group was targeted specifically for Probation Level 2 students. Do you think this group contributed to your progress back to good academic standing? Why or why not?
Would you recommend this group to a friend?
Is there anything more we can do to help?
Other suggestions/feedback?

GPA. Since the intervention was primarily developed to improve academic achievement, it was important to collect participant GPA data before and after the intervention. At the end of the semester following the completion of the program, with participant permission, each participant's GPA was calculated and compared to their GPA before the intervention.

Data Analysis

Pre/post-intervention measures and GPA. With only three total participants and one stage of repeated measures, this qualitative study was not suited for extensive statistical analysis. However, there were certain concrete, quantifiable aspects that contributed to a comprehensive understanding of the program's academic impact. Responses on each pre- and post-survey were given a numerical value (1, 2, 3, 4, or 5 on the Likert scales and 1 or 0 on the "Yes/No" scale) with higher values representing higher levels of self-reported resilience, motivation, aptitude, time management, engagement, and use of campus resources. Total response scores were compared across participants and the percentage of increase in scores was calculated. In a similar fashion, pre- and post-semester GPAs were also calculated.

Exit interviews and journals. A systematic approach was employed to understand the essence of participants' experiences (Creswell, 2013; Moustakas, 1994). After an in-depth review of the exit interview transcripts, a comprehensive list of every participant's responses line

by line was compiled under each interview question. Journals were analyzed in a similar fashion. Significant statements in the interviews and journals were identified and listed with an equal importance placed on each. This provided a balanced and equal value to each participant perspective (Merriam, 2009). Individual meanings and thematic qualities were considered and the responses distilled down to 74 meaning units/theme statements. Considering the context of each meaning unit, theme statements emerged into three main categories: Recruitment, Benefits, and Changes Needed. The categories diverged into nine sub-categories. Under each sub-category, the theme statements were synthesized into paragraphs to produce the essence of the experience.

Ethical Considerations

It was imperative to protect the identity and confidentiality of the research participants and provide a transparent process that accurately documented their experiences. IRB approval was received prior to data collection and no participant identifying information was used in the reporting of data. Identifying information was removed from transcripts and reports during data analysis and pseudonyms were used during reporting phases of the project. Informed consent was crucial to the participants' understanding of the project and helped clarify their rights as participants.

Findings

GPA and Pre/Post-Intervention Measures

It was important to consider individual differences between participants to describe their experiences in more detail. Pseudonyms were used to protect participant confidentiality.

Henry. Henry had the lowest gains in GPA (18.6% increase: from 1.897 to 2.25) and his scores on the pre- and post-survey were comparable. After the intervention, the survey showed that Henry utilized 2 more campus resources after the intervention: the Scholarships and Financial Aid office, and first year transition workshops. He also improved his time management. He now felt he knew how to manage his time, more often planned his week out in advance, and wasted less time before deadlines.

Jessica. Similar to Henry, Jessica's total survey scores were comparable before and after the intervention. However, she had a 42.2% increase in her GPA (from 1.473 to over 2.0). Jessica started with the lowest GPA of the participants and raised it above the minimum she needed to be placed back in good standing. After the intervention, Jessica reported an increase in resilience. She believed she was more diligent, stayed with ideas longer before losing interest, and maintained her focus on long-term projects. She also used an additional campus resource after the intervention: first year transition workshops.

Mark. Mark had the largest increases in his GPA and survey scores. His semester GPA increased 76.5% (from 1.7 to 3.0), well over what he needed to return to good standing. He also increased his survey scores in every single category most notably in motivation, time management, and utilizing campus resources. After the intervention, Mark felt more motivated. He found himself wanting to do as well as he could in his classes, found it easier to motivate himself to study, claimed to set goals for grades he wanted in his classes, studied more than the minimum to pass, and was ready to do whatever it took to succeed. His time management also improved. Mark believed he now knew how to manage his time, wasted less time before deadlines, and found it easier to stick to his study schedule. After the intervention, Mark utilized 3 additional campus resources: first year transition workshops, money management resources, and peer-mentoring.

Exit Interview and Journal Synthesis

Overall, students were very positive about their experience in the group. Below is a synthesis of participants' pertinent journal entries and exit interview responses. Themes emerged into three categories: recruitment, benefits of the program, and suggested changes to the program. Several sub-themes also emerged and are discussed below.

I. Recruitment. Overall, students felt that the recruitment measures used (emails and phone calls) should have been an effective way to recruit participants. Jessica appreciated the message that was left, and Mark participated only after speaking with the facilitator on the phone. When asked, every student indicated that getting a message from their academic advisor would have been a great incentive. Two students mentioned that they prioritize reading emails from their advisor, and Henry mentioned it would be beneficial if the advisor says,

‘Hey, I know you’re my advisee but you need to talk to this person, he has this group going on, I could either schedule you for all these classes or you can sit down and have one on one help or small group help which would be more beneficial’.

II. Benefits. Students mentioned several benefits to their participation in the program. Every participant claimed they would recommend the group to a friend and indicated that because it was so personalized, the group intervention could have applied to a variety of group types. Benefits included: positive changes for students after the program, its contribution to their academic progress, the support they felt in the group, the value added with journaling, and the flexible nature of the format.

1. Positive changes. Henry’s first response indicated he was not sure how much he changed, however he claimed to have acquired some new information. Mark used the group to keep him accountable, “I use it as a weigh point throughout the week to make sure I have something done by Wednesday or after Wednesday”. Jessica felt more motivated to change how

she was handling her schoolwork. Two particular areas of discussion impacted the students: lifestyle change and campus resources.

Lifestyle change. Two students indicated that the lifestyle change discussion really resonated with them and they recognized it as crucial to their success. Jessica stated, "...I know that getting back into good academic standing...you have to make a lifestyle change and reevaluate everything you've done up until this point and how it's not working." The discussion helped Henry realize his difficulty with lifestyle change in the past and talking about it made the process of change more real.

Campus resources. Every participant mentioned the benefits of campus resources and how the group helped them recognize what is being provided for them. Jessica mentioned, "I just think I've learned more about what's available at the university so I think I've changed in terms of I'll actually use the resources that we talked about." Henry noted the importance of meeting with his advisors and professors on a regular basis.

That class I'm having a little difficulty in but sitting down and discussing it [with my instructor], I know I'm still in a good position to pass and still be on top of everything and get a good grade so...it's a matter of not being embarrassed when I screw up but looking for the help from the teachers when I need it.

Once he realized that getting help is ok, Henry realized that his instructors and advisors were very beneficial. The students also appreciated being reminded that they are already paying for services offered on campus with their student fees, and this motivated them to utilize those services.

2. Contribution to academic progress. One of the principle aims was to help high-stakes probation students get back to good academic standing. The students unanimously agreed that participation contributed to their academic progress. Participants claimed to take this program more seriously than the pre-set activities that were offered to them in previous semesters, in part because of the personal nature of the experience. One student mentioned, "I think this is the best thing I've seen so far for helping students on probation." Another said, "I think I'm finally back on track to a successful end of the year at [Midwestern University]." Being in the group reminded them that academic success is incremental and their efforts will pay off, even if they don't see it right away.

3. Supportive group environment. One key to the success of the program was the supportive group environment provided. Some comments included:

"It was nice obviously being in a group of other people so you could see that you're not just alone on probation two."

"It's just comforting to know that you're not the only person doing it."

"I'll probably continue sharing more in group settings."

"It helped me with getting help from others and getting different opinions."

Students recognized they were helping others and appreciated their role in the group. They liked that everyone pitched in together and became accountable to each other. Support from the group gave them a sense of purpose and hope. Henry liked that the group was not all about giving advice, because that can be subjective. He appreciated that one of the main aspects of the group was providing support to each member. He liked the personalized aspects and the fact that, “Hey somebody cares about whether I succeed or I fail. Somebody wants me to succeed.” Mark liked the fact that there was a facilitator who could direct conversations, but was not always leading the conversation. Jessica indicated just how important it was to participate in the group together,

I guess my problem is that I just have anxiety so I was thinking that it was just me doing this alone and that no one else was having this problem and I was going to get dismissed from the university and it was all out of my control. It just was spiraling and then knowing that there were at least two other people kind of going through the same thing with their academics and it was better.

The normalization and support provided by the group setting was the difference between her Probation Level-1 experience and her time with the Academic Skills Discussion Group.

4. *The value of journaling.* During the final 10 minutes of each session, group members were asked to provide a one-page response to a question posed for them to reflect on. Their responses were shared the following week and discussed. Every member of the group mentioned how this was valuable and that it contributed to their progress. Henry indicated that it helped him conceptualize his thoughts by putting them down on paper. This helped him “poke holes” in some of his rationalizing thought processes. Students felt writing things down and coming back to them helped them come to terms with what they were thinking about. Mark indicated that,

I think that it’s an important part that should continue because it’s getting people to write out what they’re thinking, maybe they might not say it all when you discuss it, but they’re writing down what they are thinking about, whatever’s going on, and so I think it’s beneficial to the group members on how the group goes.

III. Recommended changes. Two of the three students indicated that every element of the group was favorable including the topics, organization, and implementation. The students were happy with their overall experience and would be fine if nothing changed. However, there were a few suggestions, which emerged as the following categories: it was not long enough, the group needed more members, and the format needed tweaking.

1. *It was not long enough.* The most common criticism was the duration. While these students were busy studying, working, and going to class; surprisingly, they wanted to spend more time in the group sessions. Every student asked for either more sessions or more time during the sessions. Henry felt the study habit adjustments students needed would take more time than the six weeks allotted. He and Mark both suggested adding at least two more sessions. Mark said, “I wouldn’t have minded [two more sessions], because like I said, it’s kind of a weigh

point in the week; something that was always on the schedule, so I didn't really mind it." The group size was also considered, and with a potential group larger than three, there would be less time to talk and more session time would be needed. Conversations were taking too long to develop and by the time things were really rolling the time was almost up.

2. *The group needed more members.* Students often reflected "How would it have been with a larger group?" Every participant indicated that it would have been nice to have at least one or two more people in the group. Jessica noted "I think that our discussions would have been even longer and better with more people." Henry mentioned that there were probably some students that would have participated had their schedules not conflicted, and maybe this should be a consideration for future sessions.

3. *Consider a more flexible format.* While students appreciated having time with their peers, some of them wanted additional one-on-one time with the facilitator. Mark recommended:

I know that I would stop after the meeting and talk to you several times and so I think letting the group, if it's possible, that there is always one-on-one possibilities to talk if they don't want to talk about it in the group.

Similarly, Henry wanted both a bigger group in addition to more one-on-one time with a facilitator. He also suggested that more groups with more facilitators would offer more options for students with schedule conflicts. Jessica also indicated that she would have considered attending a different group at a different time on a week that she had a one-time scheduling conflict.

Emergent Findings

Findings from the pre/post measures, GPA changes, exit interviews, and journal entries tell a story about each participant.

Henry. Henry, a 32-year-old non-traditional student with difficulties following through with his academic work, was initially not sure how the group had changed him. His low GPA increase and relatively low survey increases support that idea, although there were still improvements in both areas. Counter to his classroom experiences, Henry did attend all the sessions and was conscientious and followed through with the responsibilities of the program. He felt very much like a leader in the group and found his role as more of an idea-person for the other members of the group than as a participant benefitting from the other students.

Jessica. Jessica was a 20-year-old junior with a lack of motivation and a feeling of disconnection to campus. Jessica's survey scores did not change much but her GPA increase was much more pronounced than Henry's. Based on her scores, journal entries, and comments during the exit interview, Jessica benefitted mainly from the social aspects of the group. She gained a sense of connection to campus through relationships with group members. Many of the

academic topics were unchanged on her survey responses, but her statements reflected that she highly valued having an experience where she was not alone.

Mark. Mark was a 20-year-old junior lacking study skills and an academic direction. Mark was unsure about his major and conversations in the sessions helped him decide to change his major to find a better academic fit. Mark had the most pronounced increase in scores and his comments in the exit interview reflected that this group helped him find his academic purpose and allowed him to gain new perspective on his academic experiences. This explains why his academic motivation score increased 47.4%. Mark benefitted from both the social aspects and the topical discussion aspects of the group.

Discussion

Based on this case study, the Academic Skills Discussion Group was a valid experience that succeeded in most of the things it set out to do. It was a retention intervention consistent with much of the higher education student retention literature. It targeted academically-poor students on the edge of dismissal (Fowler & Boylan, 2010; Laskey & Hetzel, 2011; Valentine et al., 2011), focused on social aspects of the student experience (Barbatis, 2010; Bellman et al., 2015; Clark & Cundiff, 2011; Grier-Reed, 2013; Tinto, 1997), created opportunities for peer-to-peer connectivity (Mattanah et al., 2010), and provided opportunities for students to relate to a university staff member (Wibrowski et al., 2016).

Results indicated that students improved their academic motivation and increased their study knowledge. All participants appreciated the experience, benefitted academically, and wanted more. Every student's grade-point average increased, to which the Academic Skills Discussion Group may have been a contributor. While self-reported resilience scores varied in intensity of change, every student reported social and/or academic benefits from the intervention. Results indicated that lifestyle change was an important element to discuss with this population. Students could understand concrete steps and begin working to change their non-productive study habits or other behaviors and lifestyles that were hindering their academic success. Both survey responses and exit interview responses reflected that participation elicited increased engagement with their institution.

Several unique elements of the program emerged as beneficial for academically at-risk students including: check-in, topical discussions, peer-to-peer feedback, facilitator contribution, and journaling. Findings indicated that students valued different aspects of the program and their outcomes varied based on their unique experiences of the intervention. Henry's status as an older student may have influenced how he experienced his role as a leader. He appreciated the chance to share during the peer-to-peer feedback component. Jessica's need for connectivity

may have helped her respond more positively to the social aspects of the program. Mark's uncertainty about a major may have influenced how he experienced the life change discussions. Mark particularly benefitted from the topical discussions.

One of the less successful elements of the intervention was the recruitment process. Although the students felt the methods were appropriate, it only resulted in three total participants, not the six to eight that would have been more ideal for discussion purposes (Yalom, 2005). It was difficult to reach non-engaged students, even if the program being offered would be highly beneficial for them.

Consistent with the Literature

As a rigorous study that examined interactions between a retention program and student characteristics, this project addressed the assessment gaps in higher education retention programs identified by Tinto (2006) and Valentine et al. (2011). The findings support theories of persistence that highlight the importance of students bonding to their institution (Barbatis, 2010; Fowler & Boylan, 2010; Tinto, 1997). This study's participants benefitted from their interactions with both the facilitator and other members of the group, which led to an increased likelihood of their persistence that semester. The findings related to these social support benefits are consistent with the report of Mattanah et al. (2010) who found that peer-to-peer interactions increased participant perceived social support and reduced loneliness. The participants of the Academic Skills Discussion Group increased their connection to campus, which according to the work of Strayhorn (2012) is an important aspect of retention, one of the main goals of this intervention. This is consistent with the findings of Wibrowski et al. (2016) and supports their recommendation that most retention interventions should contain elements of mentoring and community.

With findings consistent to persistence and retention literature, this study confirms that qualitative case study methodology (Creswell, 2013) can be used to effectively evaluate a higher education retention intervention. Triangulating and comparing data from pre- /post-surveys, GPA, student interviews, and journals proved to be an effective way to gain insight into how students were interacting with the various elements of the program and is recommended for future evaluations.

Limitations

Although the literature supported this type of intervention and its subsequent evaluation, the results are limited by certain elements of the program and study design. For instance, the number of participants was limited at three. Both the group intervention and the evaluative study would have benefitted from an increased participant pool, ideally including six to eight participants. In addition, the GPA data included variables not controlled for, such as courses

taken, which made it impossible to draw deep inferences about the effects of the program. Furthermore, the students participating only represented one college at the university. A collection of participants with a wider variety of academic programs may have produced more transferrable results. Another limit to the study was that only interviews, journal entries, pre/post measures, and GPA scores were used for data collection. The use of observational data may have produced more comprehensive results. Moreover, reliability of the interpretation was limited due to the single researcher/facilitator reviewing the data. In future studies, a collaborating researcher could be brought in to corroborate findings. Finally, while the exit interview was designed as a validation procedure for the intervention itself, the study would have benefitted from further member-checking to validate the findings of the study as a whole.

Implications for Practice

The number of at-risk students entering higher education is increasing and resource allocation to retention efforts are becoming more necessary (Schultz, 2004; Stuber, 2011; Thering, 2011). According to this case study, the Academic Skills Discussion Group intervention is effective. One main limitation of the program's current iteration is the large amount of resources it requires. One staff member working for at least seven weeks, with many hours required for planning and implementation, only to impact the academic experience of three students is relatively inefficient. Colleges should consider this intervention, but only if they want to dedicate the resources to it. Scalability may be an issue, because according to this pilot study, the attributes of this group only manifested in a small number of participants. Traditionally, the benefits of group therapy are reduced as the number of group members grows past the ideal six to eight (Yalom, 2005). To address this, a college could have multiple groups meet in one location and have a facilitator oversee multiple groups.

Recruitment is another issue that faces administrators of this program. Although the participants felt the recruitment methods were adequate, having a student's academic advisor recommend the group to students would be welcome. This would encourage students to participate who may be less inclined to engage at the college-level. Due to FERPA restrictions, it was not possible to make this a requirement for students on Probation Level-2 as they would be involuntarily sharing their academic standing with others. Therefore, the challenge was getting less-engaged students to volunteer their time to an intervention they knew very little about. A college with a larger pool of Probation Level-2 students would have an increased likelihood of putting together a group large enough to maximize the resource allocation required of the program.

Future Directions

The Academic Skills Discussion Group will be offered during subsequent academic semesters. Based on this pilot case study findings, revisions have been made to the intervention. Moving forward, the recruitment process will utilize a pre-written letter sent to academic advisors for them to send to their Probation Level-2 students to encourage their participation. Advisor contact would help normalize the group for those unaware of it. Adding more sessions (from six to eight) would address the participants' desire for more time. Additional groups, increased one-on-one time with the facilitator, and lengthening the sessions could also benefit future interventions. Regarding the program evaluation, a future assessment could be framed as a concurrent mixed methods approach (Plano Clark & Ivankova, 2016). With more participants one could utilize analysis of variance or linear regression modeling for more comprehensive quantitative data collection methods. Including multiple researchers and incorporating member-checking would also be appropriate additions to address reliability and validity. With proper administration, this intervention and its evaluative component could be used on a larger scale across the entire university. It would require multiple facilitators and possibly a facilitator-training seminar. Scalability would be an important consideration regarding allocation of resources and a future study could look at having 20-30 students per group to see if similar results occur.

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Examining Inequalities in Science Literacy by Religious Affiliation Among Adults

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Abstract

Much attention has been given to the general public's lack of understanding of science and the adverse effect of this lack of knowledge in our ever-advancing scientific and technological society. Religion remains an important social frame through which individuals interpret information, including scientific findings and facts and one deserving of closer examination in understanding disparities in public science knowledge. Using a random sample of adults in Nebraska, this study explored the association between religious affiliation and adult scientific literacy of human biological concepts. Results found a relationship between religious affiliation and adult scientific knowledge, even after controlling for confounding demographic variables such as education, age, and gender. Specifically, Evangelical/Fundamentalist Protestants had the lowest level of science knowledge compared to their counterparts with other religious affiliations and the non-affiliated. No significant gender, racial, age, or rural/urban differences emerged, but, as expected, education was positively associated with higher levels of science literacy. Implications regarding inequalities in levels of adult science literacy and strategies for educators to reduce these inequalities are discussed.

Keywords: adult science literacy inequality, religious affiliation, human biological science knowledge

Much attention has been given to the general public's lack of understanding of science and the adverse effect of this lack of knowledge in our ever-advancing scientific and technological society (Burns, O'Connor, & Stocklmayer, 2003; National Science Foundation, 2012). It is important to have scientifically literate citizens within contemporary society as scientific issues have become important parts of political issues. In addition, science is a key part of understanding and successfully implementing public policy in areas such as health and medicine and environmental studies as well as in remaining competitive in the global economy (Miller, 2010). Understanding of science is subject to social frames as individuals interpret the value and truth of scientific statements (Nisbet & Mooney, 2009). In the U.S., religion remains a significant social institution influential in public life (Finke & Scheitle, 2005). Therefore it remains an important social frame through which individuals interpret information, including scientific findings and facts.

In spaces that must contend with social frames for authority and influence--such as in formal educational systems--it is important to continue to understand how religion as a social frame influences individuals' (and students') understanding of science. Social frames, such as religious views (Nisbet & Mooney, 2009), have the potential to influence science literacy across one's life course, as there are inevitably future scientific advancements not covered in today's textbooks or educational curricula as well. Being scientifically literate allows adults to utilize and make sense of new technology and scientific information, providing important advantages within our society (Miller, 2010). Most adults need to maintain and develop science knowledge after they leave formal schooling. This is important especially for adults over thirty-five who could not have learned about more recent scientific developments during their formal school years (Miller, 2010). For example, topics surrounding stem cell research, climate change, genome mapping, and nanotechnology were not included in science educational curricula in the past.

A recent report on public attitudes and understandings of science and technology by the National Science Foundation (2012) indicates that although Americans remain interested in science and technology, many give incorrect answers to science knowledge questions. As science knowledge becomes increasingly necessary in decision making throughout people's lives and in national economic growth and innovation, understanding differences in science knowledge is a means to understand social inequality among different groups. Health/biological science knowledge is needed to make informed individual health choices as well as be informed about and have input into policy relating to public health concerns. Thus a lack of health/biological knowledge could be a source of disadvantage in individual health outcomes. This study examines public understanding of health/biological science concepts overall and explores how religious affiliation frames individual levels of biological science knowledge among adults.

Background

Americans continue to rate ‘scientist’ as a prestigious occupation, support funding of scientific research, and continue to have more favorable attitudes toward the promise of science and technology than those in other countries (National Science Foundation, 2012). Yet the public’s own knowledge of basic scientific concepts, which they would use to form these opinions, is questioned. Public understanding of science is defined as the understanding of science content or knowledge, process, and awareness of the impact of science on individuals and society (Burns et al., 2003). Around one in four American adults qualifies as scientifically literate (Miller, 2010). As an important social frame through which individuals interpret information (Nisbet & Mooney, 2009), religion has the potential to frame how science facts are received and understood. Below I outline how religion is influential in attitudes towards science as well as scientific literacy levels.

Conflicts between Religion and Science Attitudes and Beliefs

Some religious groups clash with science over moral, epistemological, and ontological issues. Research has shown that religious beliefs can play an important role in shaping public attitudes toward science and technology. For example, Gauchat (2012) found that church attendance is negatively associated with public confidence in science, controlling for other demographic categories. Particular aspects of conservative evangelical theology specifically, such as biblical literalism, beliefs about the salience of sin and evil, and theological orthodoxy, are also associated with more negative opinions of science (Ellison & Musick, 1995). These moral critiques of science include factors that seem to undermine the authority of scriptural interpretations as well as challenging the authority of God in human life (Ellison & Musick, 1995). Consequently, conservative Protestants may view some scientific studies as threats to allegiance to religious and traditional authorities and to the overall moral foundations of society. Ellison and Musick (1995) found that, compared to other Americans, conservative Protestants were more likely to hold negative views of the scientific community. Several areas of scientific research and theory are perceived to be in conflict with theologically conservative religious beliefs.

The interplay between religious beliefs and technological innovations has been complex. Religion has been associated with a distrust of nanotechnology, one of the fastest-growing research areas in the U.S. (Brossard, Schuefele, Kim, & Lewenstein, 2009), and with a distrust of genetically modified food in Europe (Gaskell et al., 2000). Nanotechnology and genetically modified food involve very small scales, either engineering molecules or altering DNA structures. Both advances are associated with moral objections to “playing God” in a sense and

seen as “unnatural,” and thus those who hold strong religious beliefs were more likely to have negative views about these technologies. Brossard et al. (2009) found that those with stronger religious beliefs also held less support for the funding of nanotechnology. Importantly, religious belief served as a filter through which knowledge affected support for nanotechnology. For the highly religious, being more knowledgeable about nanotechnology had little effect on their support for funding, meanwhile less religious respondents held a strong positive association between nanotechnological knowledge and support for funding (Brossard et al., 2009).

Another contentious topic between science and some religious beliefs is evolutionary theory. The U.S. has seen advances in science and increased attention to bolstering science knowledge and learning. Yet still many Americans hold a creationist viewpoint that is in contention with the scientific literature and community. In multiple polls, almost half of Americans believe that God created humans in their current form within the last 10,000 years, and this viewpoint has changed little within the last 30 years that Gallup has asked this question in polls (Angus Reid Public Opinion, 2012; Newport, 2012). In contrast, 30% believe humans evolved from less advanced life forms over millions of years while 18% report being not sure about the origins and development of humans on Earth (Angus Reid Public Opinion, 2012). This differs from other nations, such as Great Britain and Canada, in which only 17% and 22% respectively believe God created humans in their present form within the last 10,000 years (Angus Reid Public Opinion, 2012).

Religious affiliation is a key factor in one’s knowledge and belief in evolution or creationism. Those in more theologically conservative denominations have different views on the topic of evolution, based on specific beliefs. Biblical literalists are more likely to view science and religion as conflicting, especially concerning the theory of evolution and age of the earth, because these contradict a literalist reading of the account of human origins in Genesis (Ellison & Musick, 1995; Sherkat, 2011). Those with fundamentalist beliefs in Biblical literalism view the Bible as the word of God and thus the Bible is interpreted as the true history of the Earth and human life. A particular interpretation of parts of the Book of Genesis and the Old Testament, often referred to as “young-Earth creationism,” states that the Universe is a few thousand years old rather than approximately 14 billion years old in accordance with scientific evidence (NASA/WMAP, 2010). This interpretation is held mainly by a subset of evangelical Protestants and some ultra-orthodox Jews and Muslims (Lerner, 2000).

As a result, more fundamentalist denominations have been leading the opposition of the inclusion of evolutionary teaching in public school systems. According to Lerner (2000), the states experiencing the most disagreement about teaching creationist or evolutionary theories are in large part those that have substantial populations of evangelical Protestants. Some have fought for the promotion of teaching “intelligent design” or presenting both “creation science” and evolution in the classroom but these alternatives were ultimately denied by the Supreme Court in

1987 (Lerner, 2000; Sherkat, 2011). Some state science standards have resorted to other strategies to appease creationists, including avoiding mentioning the word evolution, ignoring human or biological evolution, or using other “creationist jargon” in school science texts (Lerner, 2000, p. 290). Overall, according to Lerner’s (2000) evaluation of state science standards, about one-third of states had unsatisfactory standards of teaching evolution in public schools.

The perceived contention around specific scientific issues may be an exception rather than the rule concerning the relationship between religion and scientific research, however. Baker (2012) found that a majority of Americans do not perceive incongruence between science and religion. Of the proportion of those who did agree that science and religion are incompatible, they emerge in two groups (similar to Barbour’s (2000) taxonomy): those taking the position of biblical literalists and those taking the position of scientific materialists (Baker, 2012). Other research indicates that religiously affiliated and non-affiliated alike support ongoing scientific research in general. The National Science Foundation (2012) has found that Americans have more positive attitudes regarding the promise of science and technology than Europeans, the Japanese, the Chinese, Malaysians, and Indians. In addition, a majority (69%) of Americans indicated that the benefits of scientific research outweigh the harmful results. A large majority support the funding of basic scientific research (82%) while 73% indicate this funding of basic research “usually pays off in the long run” (National Science Foundation, 2012, p. 7-4). In qualitative interviews, Evans (2012) found support for the continuation of scientific research regardless of individual religious affiliation or non-affiliation. The two exceptions in his interviews, however, identified as fundamentalist Protestants, warranting a more nuanced examination of more theologically conservative individuals compared to others. Religion has a relationship with scientific belief and support, at least among some denominations and concerning some scientific issues. Other empirical research has focused on whether religion is associated with actual scientific knowledge.

Religion and Scientific Literacy

Conservative denominations have more moral objections with science than other denominations. But research on the influence of religious affiliation and beliefs specifically upon levels of scientific knowledge has been mixed. Some research posits that biblical literalists possess less science knowledge, but much of this deficit has been attributed to demographic factors and unequal educational attainment. For example, Zigerell (2012) found that, although those espousing literalist views of the Bible did have less science knowledge than those with other views of the Bible, demographic and educational factors accounted for much of this difference. Other studies of education and religious affiliation have inconsistent findings. While Johnson and colleagues (2015) found that conservative Protestants are more likely to enroll in

science classes during college compared to other religious groups, Sherkat (2017) found that conservative Protestants are less likely to seek higher education and study science topics.

Yet other research indicates that religion is influential on scientific literacy, and the negative impact of religious factors is more substantial than other factors. In a nationally representative sample of U.S. adults, Sherkat (2011) found that sectarian and fundamentalist religious groups have a lower level of science knowledge than other religious groups even after controlling for gender, race, income, and education. Religion is second only to education as the strongest predictor of science literacy (Sherkat, 2011). In addition, Miller found that those with fundamentalist beliefs were less likely to be scientifically literate compared to those with moderate or liberal beliefs, controlling for age, gender, education, presence of children at home, and issue interest. Overall, research is mixed on the influence of religion upon science literacy and studies often focus on general science knowledge, leaving a gap in research about specific types of science literacy.

Present Study

Building upon the foundations of previous research, this study examined inequalities in public understanding of science by one source of social framing--religious affiliation. To expand upon previous research showing mixed results, I explored whether religious affiliation has an association with science knowledge, controlling for sociodemographic factors. Adding to research on science knowledge broadly defined, I specifically explored health/biological science knowledge, as this type of science knowledge may be increasingly important in other areas such as health decision-making. Special attention was paid to different types of Protestantism to explore the associations among more conservative and more mainline groups and level of science literacy.

Data and Method

Data

This study used the data gathered in the 2010-2011 Nebraska Annual Social Indicators Survey (NASIS, 2011). The NASIS survey contains items on current, topical information and was a joint effort of the Department of Sociology at the University of Nebraska-Lincoln and a variety of public agencies. NASIS 2011 was administered as a mail survey to adults over the age of 19 in the state of Nebraska. The sampling design of the 2011 NASIS mail survey used a directory-listed sample of household addresses. A total of 906 out of 2304 adults completed the

mail survey, resulting in an overall response rate of 39.3% after adjusting for undeliverable returns and known ineligibles. Sampling weights were calculated and adjust for geographic region, age, gender, number of adults in the household, and non-response bias in the samples (NASIS, 2011). Listwise deletion of missing data on this study's variables of interest resulted in a final analytic subsample of 653.

Dependent Variable: Science Knowledge

This study examined five items used to assess adults' understanding of various human biological concepts for the University of Nebraska State Museum as a part of the larger Biology of Human project. These items used a 5-point Likert response scale asking respondents to indicate how much they agree or disagree (1=Strongly disagree, 2=Disagree, 3=Neither agree nor disagree, 4=Agree, 5=Strongly agree) with each of the following statements: "Humans share common ancestors with apes"; "Vaccines use our body's natural defenses to cure disease"; "We owe our lives to the community of other organisms that share our bodies"; "Death is part of the biology of life"; and "Many diseases result from interactions between genes and the environment." For each item, agreement is the accepted correct response within the scientific community. Yet leaving the index items in the Likert format they were collected in allowed for a more detailed analysis of the incremental levels of agreement/disagreement that may accurately represent individuals' nuanced uncertainty with these factual statements beyond simply transforming the Likert scale into a dichotomous correct vs. incorrect (i.e., agreement vs. disagreement) variable. Exploratory factor analysis indicated that these five items loaded onto a single factor. An overall indicator of human biological science knowledge was created by averaging responses to the five items, with a Cronbach's α of 0.64.

Focal Independent Variable: Religious Affiliation

Religious affiliation was coded into a series of dichotomous variables for comparison purposes. Protestant affiliation was coded into Evangelical/Fundamentalist Protestants, which is a combination of those self-identifying as Evangelical or Fundamentalist Protestants; Mainline Protestants, which is a combination of both Mainline and Liberal Protestants; and Other Protestants. In addition, respondents who reported having Protestant affiliation but who did not provide a denominational affiliation comprise the Non-specified Protestants category. Catholics and the Non-affiliated respondents comprise their own respective variables. Jewish, Muslim, and all other religious affiliations were combined into an Other/Non-Christian variable.

Control Variables

Several control variables were included in the analyses. Gender was a dichotomous variable with women coded as 1. Race was coded as a dummy variable with Non-white coded as 1. Education was measured in the question “What is the highest degree you have obtained?” and was recoded into three dichotomous categories: High school or less; Some college to 2 year degree; and 4 year degree or more. Income in the past year was coded into three dichotomous categories: \$39,999 and below, \$40,000-\$74,999, and \$75,000 and above. Age of respondents was coded in years. Marital status was coded with married as 1. Geographic status was coded as 1 for those living on a farm or in open country and 0 for those living in a town or city.

Analytic Plan

Bivariate associations were conducted for religious affiliation and science knowledge. Then multivariate associations were estimated in ordinary least squares (OLS) regression models to examine the association between religious affiliation and human biological science knowledge. The regression models allowed for controlling for other sociodemographic variables that may influence science knowledge. Based on previous research on religious beliefs that influence understandings of science concepts, Evangelical/Fundamentalist Protestants serve as the comparison group for religious affiliation.

Results

Sample descriptive statistics can be found in Table 1. The average score on the human biological knowledge index was 3.71 out of 5. A majority of respondents indicated a religious affiliation of Catholic (approximately 24%), Mainline Protestant (approximately 20%), or Evangelical/Fundamentalist Protestant (approximately 17%). Women comprised half of the sample, and the average age of the respondents was 46 years. A small proportion (under 3%) of the respondents were non-white and about 18% lived in a rural location. Regarding education, 16.5% had a high school diploma or less, 39% had attended some college or received a 2-year degree, and 45% held a bachelor’s degree or higher. Income distribution among the sample indicated 30% of respondents reporting \$39,999 or below, 33% in the middle income range, and approximately 37% in the highest income range.

Table 1
Descriptive Statistics

	Mean/Percent	SD	Min	Max
<u>Dependent variable</u>				
Science knowledge index	3.71	0.67	1	5
<u>Focal Independent variable</u>				
<i>Religious affiliation</i>				
Evangelical/Fundamentalist				
Protestant	17.41%			
Mainline Protestant	20.43%			
Other Protestant	7.73%			
Non-specified Protestant	15.02%			
Catholic	23.63%			
Other/Non-Christian	5.01%			
Non-affiliated	10.78%			
<u>Control variables</u>				
Women	50.46%			
Age	46.00	16.91	19	100
Non-white	2.54%			
Live on farm/open country	18.29%			
<i>Education</i>				
High School or Less	16.51%			
Some College/2 Year Degree	38.76%			
4 Year Degree+	44.73%			
<i>Income</i>				
\$39,999 and Below	30.03%			
\$40,000 to \$79,999	33.14%			
\$80,000+	36.84%			

N=653

ANOVA F-tests with post hoc Bonferroni tests of differences in means were conducted to determine if differences in science knowledge across religious affiliations were statistically significant (Tables 2 and 3). There were significant bivariate associations between religious affiliation and science knowledge $F(6, 646) = 20.87, p < 0.001$. Evangelical/Fundamentalist Protestants had a significantly lower mean level of science knowledge ($M = 3.22$ $SD = 0.64$) compared to almost all of the other groups, except Other Protestants. In addition, the Non-affiliated had a significantly higher mean level of science knowledge ($M = 4.13$ $SD = 0.61$) compared to all other religious groups.

Table 2

One-Way Analysis of Variance of Science Knowledge by Religious Affiliation

Source	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Between groups	6	46.90	7.82	20.87	<0.001
Within groups	646	241.96	0.37		
Total	652				

Table 3

ANOVA Comparisons of Science Knowledge by Religious Affiliation Groups

Group	<i>n</i>	Mean	<i>SD</i>	Bonferroni Multiple Comparisons	
				Evang/Fund Protestant	Non-affiliated
Evang/Fund Protestant	131	3.22	0.64		<0.001
Mainline Protestant	164	3.80	0.60	<0.001	<0.01
Other Protestant	29	3.56	0.70		<0.001
Non-specified Protestant	86	3.59	0.60	<0.001	<0.001
Catholic	160	3.75	0.57	<0.001	<0.001
Other/Non-Christian	23	3.97	0.71	<0.001	<0.001
Non-affiliated	60	4.13	0.60	<0.001	

Ordinary least squares (OLS) regression models were estimated to examine the association between religious affiliation and human biological science knowledge while controlling for other demographic variables (Table 4). Model 1 predicted science knowledge by the various sociodemographic variables and Model 2 was a full model with both religious affiliation and demographic variables predicting science knowledge. In Model 1 examining sociodemographics, only education level was found to be associated with science knowledge, with both those having some college ($b = 0.20, p < 0.05$) and those with at least a Bachelor's degree ($b = 0.24, p < 0.01$) had higher science knowledge compared to those with a high school degree or less.

Model 2 explored whether these differences remain while controlling for demographic factors. Even after controlling for gender, race, education, income, rural/urban location, and age, significant differences in science knowledge remained across religious affiliations. All other religious denominations reported higher science knowledge compared to their evangelical and fundamentalist Protestant counterparts. Non-religiously affiliated respondents reported almost a point higher on the index ($b = 0.95, p < 0.001$) compared to Evangelical/Fundamentalist Protestants. Those who were a part of Other/Non-Christian religious affiliations were over two-thirds of a point higher ($b = 0.68, p < 0.001$) while Mainline Protestants ($b = 0.60, p < 0.001$) and Catholics ($b = 0.59, p < 0.001$) had similar levels of higher science knowledge compared to Evangelical/Fundamentalist Protestants. Other Protestants ($b = 0.33, p < 0.05$) and Non-specified Protestants ($b = 0.42, p < 0.001$) also reported higher science knowledge than Evangelical/Fundamentalist Protestants, controlling for demographic variables. In examining the control variables, education remained positively associated with science knowledge in this full model, as expected (Sherkat, 2011). Examining the change in R^2 for Model 1 and Model 2, religion increased the explained variance in science knowledge by 0.17 and this increment in R^2 was significant, $F(6, 638) = 19.44, p < 0.001$.

Table 4

OLS Regression Models Predicting Science Knowledge by Religious Affiliation and Demographics^a

	Model 1		Model 2	
	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Mainline Protestant			0.60	0.08 ***
Other Protestant			0.33	0.15 *
Non-specified Protestant			0.42	0.10 ***
Catholic			0.59	0.09 ***
Other/Non-Christian			0.68	0.13 ***
Non-affiliated			0.95	0.11 ***
<i>Controls</i>				
Women	-0.02	0.06	0.01	0.06
Age	-0.003	0.002	-0.002	0.00
Non-white	0.003	0.13	0.03	0.09
Live on farm/open country	-0.07	0.08	0.02	0.08
Some College/2 Year Degree	0.20	0.10 *	0.17	0.08 *
4 Year Degree+	0.24	0.09 **	0.21	0.08 **
Income \$40,000 to \$79,999	0.02	0.08	0.02	0.07
Income \$80,000+	0.12	0.09	0.10	0.08
<i>R</i> ²	0.04		0.21	
<i>R</i> ² change			0.17	
	<i>F</i> (8, 645) = 2.53, <i>p</i> < .01		<i>F</i> (14, 639) = 9.81, <i>p</i> < .001	

^aOmitted reference groups are Evangelical/Fundamentalist Protestants, High School or less, and Income \$39,999 or below

****p* < .001; ***p* < .01; **p* < .05

n=653

Discussion

This study explored the association between religious affiliation and adult scientific literacy of human biological concepts. Overall, I found a relationship between religious affiliation and adult scientific knowledge, even after controlling for confounding demographic variables such as education, age, and gender. Support was found for previous research indicating differences in science knowledge by religion that is not explained by demographic factors (Miller, 2010; Sherkat, 2011). Specifically, as expected, Evangelical/Fundamentalist Protestants had the lowest level of human biological science knowledge compared to their counterparts in other religious groups and the non-affiliated. No significant gender, racial, age, or rural/urban differences emerged, but higher education was associated with higher levels of science literacy.

Beliefs associated with Evangelical and Fundamentalist Protestantism may affect one's scientific knowledge or willingness to see scientific research as valid when compared to important religious beliefs. This includes beliefs in the inerrancy of the Bible, God's authority, and moral objections to scientific authority. Even when educational level is taken into account, science and science knowledge may be seen as undermining religious beliefs and authority, and therefore are seen as inaccurate by those in theologically conservative religions. Lower levels of science knowledge among Evangelical/Fundamentalist Protestants may become more influential as they have garnered more support in recent years and have seen increases in the likelihood of reporting a strong religious affiliation (Schwadel, 2013). These differences in scientific knowledge, or perhaps more accurately the belief in scientific knowledge, may lead to inequalities and differences among those with more science literacy compared to those with less.

Educators, who must disseminate scientific information to students with various types of social frames, may encounter the perception among some students that science and religion are inherently in conflict. This may be important especially when teaching science to students with conservative Protestant backgrounds or beliefs. Exposure to science facts does not undermine religious perspectives among young adults (Uecker & Longest, 2017) and, of course, would not be the goal of educators. Alternatively, educators may draw upon other perspectives and worldviews utilized by others that emphasize that religion and science are compatible (Noy & O'Brien, 2016), or at least work to de-emphasize the conflict perspective. For example, this could include discussing groups and individuals that hold both scientific and religious perspectives (including some science professors (Ecklund, 2010; Gross & Simmons, 2009)) or sharing that many individuals have a more complex understanding of science and religion that includes how both are compatible and can complement one another (Longest & Smith, 2011; Scheitle, 2011). In a study of college students, Scheitle (2011) found that a majority of students thought that science and religion could support one another or are separate aspects of reality. In addition, young adults who view religion and science as compatible are more religious than those

who do not hold this perspective (Uecker & Longest, 2017). Thus, these strategies could help increase conservative Protestant students reception of science in particular and may help decrease inequalities in science knowledge.

Limitations and Future Research

Limitations of the current study provide avenues for future research. First, one limitation future research could address is in constructing science knowledge indices that do not contain specific topics known to challenge some religious beliefs. Indeed, some research has found that some items (e.g., about the big bang or evolution) are more typified as measures of a religious belief dimension than they are measures of scientific knowledge (Roos, 2014). Whether disagreement with specific scientific concepts such as the big bang and evolution is still concerning or an area of potential disadvantage compared to disagreeing with other science concepts or ideas remains up to individual opinion. Some may consider a rejection of specific ideologically-conflicting concepts to be a problem of science literacy, regardless of whether the reason for rejection is religious or not. Constructing a highly reliable index without including the evolution item could not be done, so the item was left in the index for the current study's analyses. Yet additional exploratory analyses indicate that significant differences in science knowledge by religious affiliation remain even when the index was constructed without the human evolution item (results available upon request). In addition, a more nationally representative sample would allow for results to be generalized to the U.S. population as a whole. Also, a closer examination of those who selected "Neither agree nor disagree" in comparison to those who agree or disagree with the science knowledge items may be fruitful in understanding those who may be satisficing by choosing an option similar to "No opinion" or "don't know" (Krosnick, 1991).

Other future research should expand on the scope of the current study. Future research should examine scientific literacy and understanding more broadly. Human biological conceptual knowledge is one of many important types of science knowledge. Future examination should also include other aspects of religion, such as strength of affiliation or religious salience among different groups for influence upon science knowledge as well. Finally, the results are generalizable to adults living in Nebraska in 2011 and future research should expand to the national population.

Conclusion

The current study found that inequalities in science knowledge by religious affiliation remain, even though most Americans do not perceive incompatibility between science and religion (Baker, 2012) and some scholars reject the thesis that there is inherent conflict between the two (Barbour, 2000; Evans & Evans, 2008). Science literacy is becoming increasingly relevant as our society and world become more dependent upon technological and scientific advances and as the global economy continues to expand in these markets as well. Everyday decisions, product purchases, health choices, certain job skills, and interactions with technology will depend on a scientifically-informed public. Those at odds with science or scientific advances may influence the future of funding for scientific research as a public citizen. In addition, those with less science knowledge may become left behind, and thus disadvantaged, in our society. At all ages, being informed citizens is seen as a general public good, and inequalities in science knowledge may impact individual health behaviors and engagement with public health policy.

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Applying Encoding and Retrieval Techniques to Chinese Rhyme Reading in Advanced Placement Chinese Instruction

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Abstract

Learning Chinese as a foreign language is increasingly prevalent in public school districts in the U.S. As ACTFL (2011) reported, an increasing number of enrollments of Advanced Placement Chinese courses indicate a growing demand for Chinese language courses in U.S. public school districts (ACTFL, 2011; ACTFL, 2017). AP foreign language exams indicate that students from the mainstream culture in the U.S. do not perform as well as racial minority test takers (Brown & Thompson, 2016). Therefore, implementing appropriate teaching strategies in a student-centered foreign language environment is a desperate need. This is a pragmatic instructional design proposal, which emphasizes the importance of using encoding and retrieval strategies on Chinese rhyme reading in AP Chinese courses at the secondary level. The pragmatic proposal is established based on two primary concerns. First, with the calling for student-centered teaching strategies in primary education, it is necessary for instructors to understand how learners learn, and to apply appropriate strategies accordingly to instruct students' learning. Second, standardized tests are often criteria for evaluating students' learning; it is practical to conduct student-centered teaching, acknowledging an exam-driven educational environment. If the instructor can apply strategies from a cognitive psychology perspective, teachers can then focus on student-centered learning in an exam-driven educational environment. This proposal overviews an instructional design approach that relies on encoding and retrieval techniques to enhance rhyme reading instruction in a secondary AP Chinese class.

Key words: instructional design, encoding, retrieval, rhyme reading, student-centered, secondary, language teaching

Background

Results of Advanced Placement (AP) exams are regarded as indicators of successful college completion rates, and an increasing number of school districts offer AP courses in the U.S. (Dougherty, Mellor, & Jian, 2006). Acknowledging the emerging role of China in the global economy, Chinese language learning is increasingly in demand in U.S. public schools. According to the report of 2011 American Council of Teaching Foreign Languages (ACTFL) surveys, enrollment in Chinese language classes in U.S. public schools has nearly doubled between 2004 and 2008 (Taguchi, 2015). The College Board Advanced Placement Program, which is the administrative organization of AP programs in the U.S., states in *Chinese Language and Culture Course Description (Effective Fall 2015)* that the AP Chinese test aims to evaluate learners' understanding of Chinese society, and their ability to integrate language and culture customs into interpersonal communications.

However, AP foreign language evaluation in the U.S. encounters an inevitable problem, as Brown and Thompson (2016) point out. In their 36-year study of AP exam performance in the U.S., Brown and Thompson note that Caucasian students “lose their ground” to “racial minority test takers” in AP language exams (p. 235). At this point, it is necessary for foreign language instructors to ponder two questions: How do native English speakers mentally process foreign languages? And, what retention strategies can instructors apply to enhance adolescents' foreign language learning? To answer the two questions, this paper states what AP Chinese exam and AP Chinese rhyme reading are, and proposes the instructional design from two aspects. First, the intervention is based on cognitive process in human memory system: cognitive process, encoding and retrieval, and the cognitive process in Chinese reading comprehension. Second, the intervention relies on applying encoding and retrieval strategies to enhance students' Chinese rhyme reading abilities.

AP Chinese Exam

In the AP Chinese test, there were three modes: Interpersonal Mode, Interpretive Mode, and Presentation Mode. See Table 1 for an overview of these three modes.

Table 1

AP Chinese Test Modes (based on College Board, 2015)

Modes	Definition	Question Types
Interpersonal Mode	The Interpersonal mode contains autonomous two-way interaction, such as conversing face-to-face or exchanging written correspondence.	Discourses, listening and one free response speaking
Interpretive Mode	Interpretive Mode aims to let students interpret a wide range of literacy and spoken content.	Listening comprehensions and reading comprehensions such as news broadcasts, fragments of movies and television dramas.
Presentation Mode	Presentation mode aims to test Students' speaking and writing proficiency.	One spoken presentation and two writings e.g. creating level-appropriate speech/report, narrate personal experiences

Among the three modes, the Interpretive Mode is the most difficult section to non-native Chinese speakers because, besides identifying characters in the readings, it also integrates pragmatic usage of Chinese, such as culturally corrected syntax and vocabulary. Therefore, this part requires learners to understand Chinese customs and habits, including spoken announcements, news broadcasts, advertisements, written prose, folk rhyme, and micro-fiction. Thus, it is vital to teach Interpretive Mode strategically in a secondary level Chinese class. Among the readings, folk rhyme reading style is the most difficult, because folk rhyme is usually very short, and it is made up of independent subjective structures. The sample of Chinese folk rhyme reading will be discussed in the segment of *The Introduction of an AP Rhyme Reading Example*. The following discusses what cognitive process is and how it works in Chinese reading comprehension.

The Introduction of an AP Chinese Rhyme Reading Example

This section will introduce the idea of Folk Rhyme Reading, and the ideas to apply encoding methods to secondary AP Chinese instruction: 陕西八大怪 *Shaanxi Eight Big Odd Things*.

Instruction goals should be clear in exam-driven teaching. The aim of exam-driven teaching is to help learners independently answer exam questions correctly. Therefore, instructors need to design each class by clarifying what students can acquire, and what students need to know about test questions. Instructional strategies with encoding and retrieval theories can enhance the ability of learners to answer exam questions. In the Interpretive Mode section, the most difficult part is to comprehend pragmatic Chinese in folk rhyme reading, since the folk rhyme delivers information about a diverse culture with only a few words. Similar to colloquial English conversation, learners are required to understand the cultural context of the reading and adapt it to recognizing Chinese characters as well as their implicit meanings.

陕西八大怪

(Chinese pinyin: Shǎnxī bādà guài, Shaanxi Eight Big Odd Things)

面条像腰带，碗盆难分开，(Miàntiáo xiàng yāodài, wǎn pén nán fēnkāi)

手帕头上戴，唱戏吼起来，(shǒupà tóu shàng dài, chàngxì hǒu qǐlái)

辣子是道菜，大饼像锅盖，(làzǐ shì dào cài, dà bǐng xiàng guō gài)

房子半边盖，吃饭不坐蹲着来。(fángzi bànbiān gài, chīfàn bù zuò dūnzhe lái)

Its English meaning is:

Noodles (are) like belts, bowls (are) difficult to separate,

Handkerchief (is) worn (on) head, singing opera (sounds like) roar(ing) up,

Spicy pepper is a dish, pancake (is) like a lid,

House (is) half covered, (people) do not sit (but) squat to eat.

To enhance adolescent learners' comprehension of the Chinese folk rhyme reading, instructors must be well prepared to develop encoding strategies. First of all, the instructor needs to work from reading questions to decide what encoding strategies can be applied accordingly. There are five questions related to this folk rhyme (Xu, 2009). The original questions are in italics and the suggested encoding strategies are in the parentheses. The categories of encoding methods are bolded in the following questions before making the design:

1. *"What is the rhyme about?"* (Xu, 2009, p. 88) (**Understanding the title- Elaborative encoding**)

As mentioned previously, elaborative encoding establishes the connection between prior knowledge and knowledge to-be-remembered. The instructor reads the title with pauses between words to help learners connect their prior knowledge with the title, "Shǎnxī /bādà/ guài". In this

way, learners can retrieve the meaning by linking up Shaanxi (a province in China) Eight (number) Big (size) Odd Things.

2. *“According to the rhyme, which statement is true about the noodles in the Shaanxi region?”* (Xu, 2009, p. 88) (**Able to tell the hidden verb in the first independent subjective structure-Elaborative encoding**)
3. From the English interpretation, “Noodles (are) like belts, bowls (are) difficult to separate”, we can clearly see the difference between Chinese rhyme and its English meaning; the verbs are the key to comprehending the rhyme. Therefore, learners are required to mentally insert the hidden verbs. This skill asks for learners’ prior knowledge of Chinese syntax connecting with the ability to interpret rhyme.
4. *“Which of the following is most likely to be true about the local opera?”* (Xu, 2009, p. 88) (**The differences from other Chinese opera-Acoustic encoding & Elaborative encoding**)

The answer is located in the second line, “singing opera (sounds like) roar(ing) up”. Compared to the Beijing Opera and the Shanghai Opera (also called Yue Opera), which learners have explored at the novice level in Chinese classes, the notable characteristic of Shaanxi Opera is “roaring”. Instructor can play an audio recording of Shaanxi Opera and compare it to Beijing Opera and Shanghai Opera to enhance student understanding of the Shaanxi Opera.

5. *“What is special about the dining customs?”* (Xu, 2009, p. 89) (**Last independent subjective structure-Visual encoding**)

The answer is in the last line of the rhyme, “吃饭不坐蹲着来, chīfàn bù zuò dūnzhe lái”, which means “(people) do not sit (but) squat to eat”. Visual encoding means learners encode the image and convert the information to store it to their mental pictures. Even though students need to use elaborate encoding methods to connect their prior knowledge of various local cultures in China, an imagery encoding method can also facilitate the understanding of the custom. Therefore, the instructor can present an image of the eight big odd things to enhance the information.

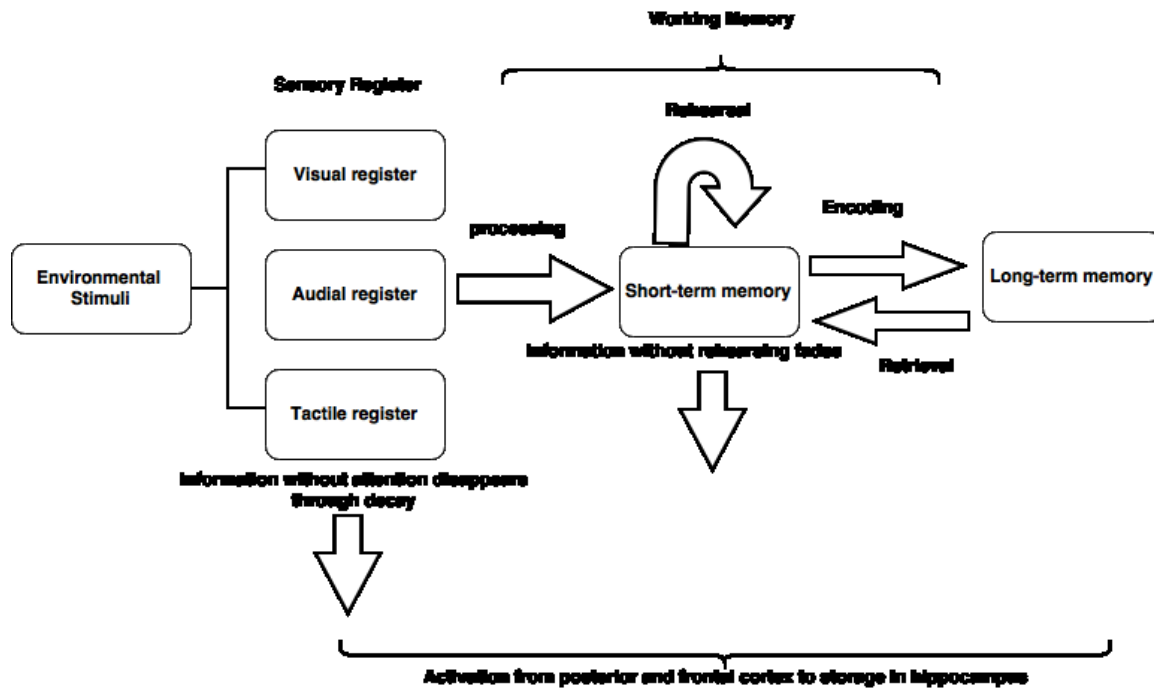
6. *“What is an unusual accessory that local people wear on their heads?”* (Xu, 2009, p. 89) (**Third independent subjective structure-Visual encoding**)

This question is related to Line 2 “手帕头上戴, shǒupà tóu shàng dài” (Handkerchief (is) worn (on) head). An image of the custom can enhance learners to encode the rhyme through visual encoding.

Cognitive Process in Human Memory System

Figure 1

Cognitive Processing Chart



Note: Figure is based on information contained in Bach-y-Rita and Kercel (2003), Baddeley (2003), Bruning, Schraw and Norby (2011), Driver and Noesselt (2008), and Scott (2017)

The cognitive process in human memory systems consists of sensory register, short-term memory storage and long-term memory storage (Atkinson & Shiffrin, 1968). As Figure 1 (modified based on Bach-y-Rita & Kercel, 2003; Baddeley, 2003; Bruning, Schraw, & Norby, 2011; Driver & Noesselt, 2008; Scott, 2017) presents, in the cognitive process, the action of coding information happens from the sensory register and short-term memory to long-term memory. The sensory register receives information from the senses, such as visual sensory register, audial sensory register (Bach-y-Rita & Kercel, 2003; Driver & Noesselt, 2008) and tactile sensory register (Bruning et al., 2011; Watanabe & Iwai, 1991). Information that is paid attention to is processed in the working memory, and some information is forgotten over time (Bruning et al., 2011). In short-term memory storage, information is divided into two types: rehearsed information—which is retained—and unrehearsed information—which disappears. Rehearsed information is stored in long-term memory storage for further retrieval. The working memory is stored in the posterior and frontal cortexes, and long-term memory storage and retrieval are active in the hippocampus (see Figure 1). Scott (2017) found that encoding from long-term memory “produced activities in the hippocampus” but no working memory encoding

activities were detected in the hippocampus (Scott, 2017, p. 116). Thus, there are two types of encoding: encoding in working memory and long-term memory encoding.

In the human brain, the later sensory cortical regions are regarded as the starting point of working memory (Scott, 2017). The working memory (Baddeley & Hitch, 1974) contains short-term information storage, as well as encoding the information needed for a broad range of sophisticated cognitive activities (Baddeley, 2003). Scott (2017) shows that “within working memory’s delay period are activities in different regions of the dorsolateral prefrontal cortex” (p. 109); these activities control logical thinking components, such as reasoning, language comprehension and learning (Baddeley et al., 1974). To comprehend information (e.g. written texts and aural information), working memory involves a process of encoding and short-term memory storage. Encoding is the process of converting information according to related events (Friedman & Johnson, 2000), which have a keen demand on human attention (Craig, Govoni, Naveh-Benjamin & Anderson, 1996). By encoding into meaningful parts, short-term memory storage can be increased (Sauseng et al., 2009). When processing information, the brain exploits various components to help encode the information and categorize the information into long-term memory. Magnetic resonance imaging (fMRI) data indicates that long-term memory, such as episodic memory and item memory, is active in the hippocampus (Scott, 2017; Wright, Renoir, Gray, & Hannan, 2017). Mergel (1998) showed that long-term memory has an unrestricted capacity. Mergel (1998) states that deeper levels of cognitive process generate linkages between old and new information, which eases successful retrievals. Retrieval requires cognitive or inhibitory control to select correlated items from memory (Healey, Ngo, & Hasher, 2014), and retrieval is an automatic reaction in long-term memory storage, which is not influenced by external disturbances (Weeks & Hasher, 2016). The next section describes encoding and retrieval, and explains the relationship between encoding and retrieval, and learning the Chinese language.

Encoding and Retrieval

Long-term information storage happens in the hippocampus, which is located in the middle area of the brain. Long-term memory encoding blocks and recall blocks are located in the hippocampus (Zeineh, Engel, Thompson, & Bookheimer, 2003). As Zeineh et al. (2003) point out, encoding blocks use various methods of maintenance rehearsal, imagery, elaborative encoding, semantic encoding, and metacognition (Bruning, et al., 2011, Table 2). Encoding in working memory works on sending a combination of information and its encoding components to memory.

Table 2

Encoding Methods in Memory (Bruning, et al., 2011)

Encoding Methods	Definitions	Examples
Maintenance rehearsal		Students repeatedly speak or think about a piece of information during learning.
Imagery	Including visual encoding and acoustic encoding.	When people looking at a two-dimensional form picture, for example, to memorize the picture of a saxophone performer or a woman, people can encode the image and convert the information to store it into mental pictures.
Elaborative encoding (Lockhart, 2002)	Establishing the connection between prior knowledge and knowledge to-be-remembered.	
Semantic encoding	Including chunks and mnemonics	Non-native Chinese learners use English letters or words to encode Chinese pronunciation. For instance, 手臂, which means arm in English, in Chinese pinyin, it is Shǒubì, and marked as “show bee” in the text book, <i>Our Chinese Classroom Primary 1</i> (Xu, 2011, p.20)
Metacognition	It is a strategy of “thinking about thinking” (Brown, 1980)	A learner writes a reflection to retrieve what s/he has learned and how the learning processed in his/her mind.

The encoding components work as subsequent retrieval cues to help recall blocks in the hippocampus (Zeineh et al., 2003) to retrieve the information. The optimal encoding methods include maintenance rehearsal, imagery, elaborative encoding, semantic encoding, and metacognition (Bruning, et al., 2011). Once the brain detects the encoded information, it

enhances the long-term memory of the information. Encoding specificity is strongly linked to retrieval (Bruning et al., 2011), because people recall information by recalling the cues of the encoding components from encoding methods. When needing the information, the brain subsequently activates re-access of the information in encoding blocks, and sends it to recall blocks, to retain the information. The following part is a brief description of the relationship between cognitive neuroscience and Chinese reading comprehension.

Cognitive Process and Chinese Reading Comprehension

Chinese written text consists of two dominant elements: characters and pinyin (alphabet). Chen (1996) discovered that semantic processing of Chinese reading involves unique cognitive processing of characters and phonological awareness. Unlike comprehending English or other alphabet languages, when people read Chinese characters and pinyin, more areas of the cerebral cortex are involved (Fu et al., 2002). When processing Mandarin, non-native Chinese speakers have “the left and right frontal lobes” active (Tham et al., 2005, p. 579). When people read Chinese, analyzing precise-, vague- meaning characters, and two-character words, the neural system produces extensive activity in the left frontal cortex, and the left frontal cortex is active when conducting semantic retrieval (Tan et al., 2000). Thus, because of the informational challenges to the cerebral cortex, non-native Chinese speakers are more likely to feel mental exhaustion when reading and comprehending Chinese

Some researchers find comprehension is a little different in Chinese rhyme readings. Li et al. (2014) detected that when comprehending Chinese rhyme readings, the right middle frontal gyrus in the cortex is more active. The right middle frontal gyrus, as Japee et al. (2015) explain, influences the control of reorienting attention from external factors. Therefore, comprehending Chinese rhyme reading is assumed to prevent non-native Chinese speakers from exoteric distractions. Rajah et al. (2011) state that middle frontal gyrus impacts retrieval activity and performance, and people can enhance retrieval by modifying activities in the brain. When encountering frequent Chinese characters, people repeat “a process of retrieving, formulating, and coordinating the phonological output” (Kuo et al., 2003, p. 720). Therefore, it is also assumed that strategically encoding reinforces adolescent non-native Chinese speakers to retrieve Chinese folk rhyme readings.

Xiang Lam (2016) proposed that the use of the imagery strategy as a semantic ability predicted better performances for adolescent language learners. Inhoof and Liu (1998) discovered that there were extensive similarities between coding morphological Chinese characters and alphabetic English texts. Zhang and Li (2016) also found that higher proficiency second language learners had a higher awareness of morphological Chinese characters. They comprehend Chinese readings more dependent on characters, and intermediate learners tended to

rely on orthographic information of a new character. With the overlap of Chinese character recognition and alphabet English awareness, elaborative encoding method was recommended in the following instructional design. Additionally, based on the previous studies of cognitive process in Chinese reading comprehension, other encoding methods suggested in the AP rhyme reading instruction are imaginary (e.g. visual encoding) and phonologic awareness (e.g. acoustic encoding).

An Instructional Design of Teaching the AP Level Rhyme Reading

The instruction design of teaching rhyme reading in an AP Chinese class is composed of seven procedures (Figure 2):

- The teacher categorizes possible encoding strategies according to the reading questions,
- The teacher plays audial text to enhance non-native Chinese speakers' sense of rhyme,
- The teacher uses imagines to assist students encode a gist of rhyme,
- The teacher has students create their connection between Chinese characters and English by cooperatively working in Google docs,
- The teacher creates flashcard activities of novel characters,
- The teacher has students using metacognitive writing to retrieve the reading, and
- The teacher has students working on the questions in the reading comprehension.

The details of each procedure are stated in the following part.

This Chinese folk rhyme reading can be divided into eight chunks based on the eight independent subjective structures. The instructor presents one picture of the eight kinds of customs as a general idea of each chunk, to help learners with semantic encoding of the rhyme. Moreover, as Tan et al. (2000) proves that when non-native Chinese speaker analyze Chinese, their left frontal cortex is active. In the auditory word-pair experiment, Petersson, Reis, Castro-Caldas, and Ingvar (1999) found that left frontal cortex is active when it conducted effective encoding and recall. Therefore, the instructor needs to apply the auditory encoding and the elaborative encoding into the comprehending part of this rhyme strategically. To help learners establish a sense of this rhyme reading, the instructor will first play an audio recording of the rhyme.

When learners are engaged into the rhyme of the vowel sound, “ài”, it connects their previous knowledge of Chinese characters with the vowel “ài”, such as 帶(dài, belt/bring), 戴(dài, wear), 菜(cài, dish) and 盖(gài, lid/build). Therefore, a pictorial text can also help learners incorporate the understanding of this rhyme with their previous knowledge. This strategy will also help them produce “cues” to retrieve information in the future.

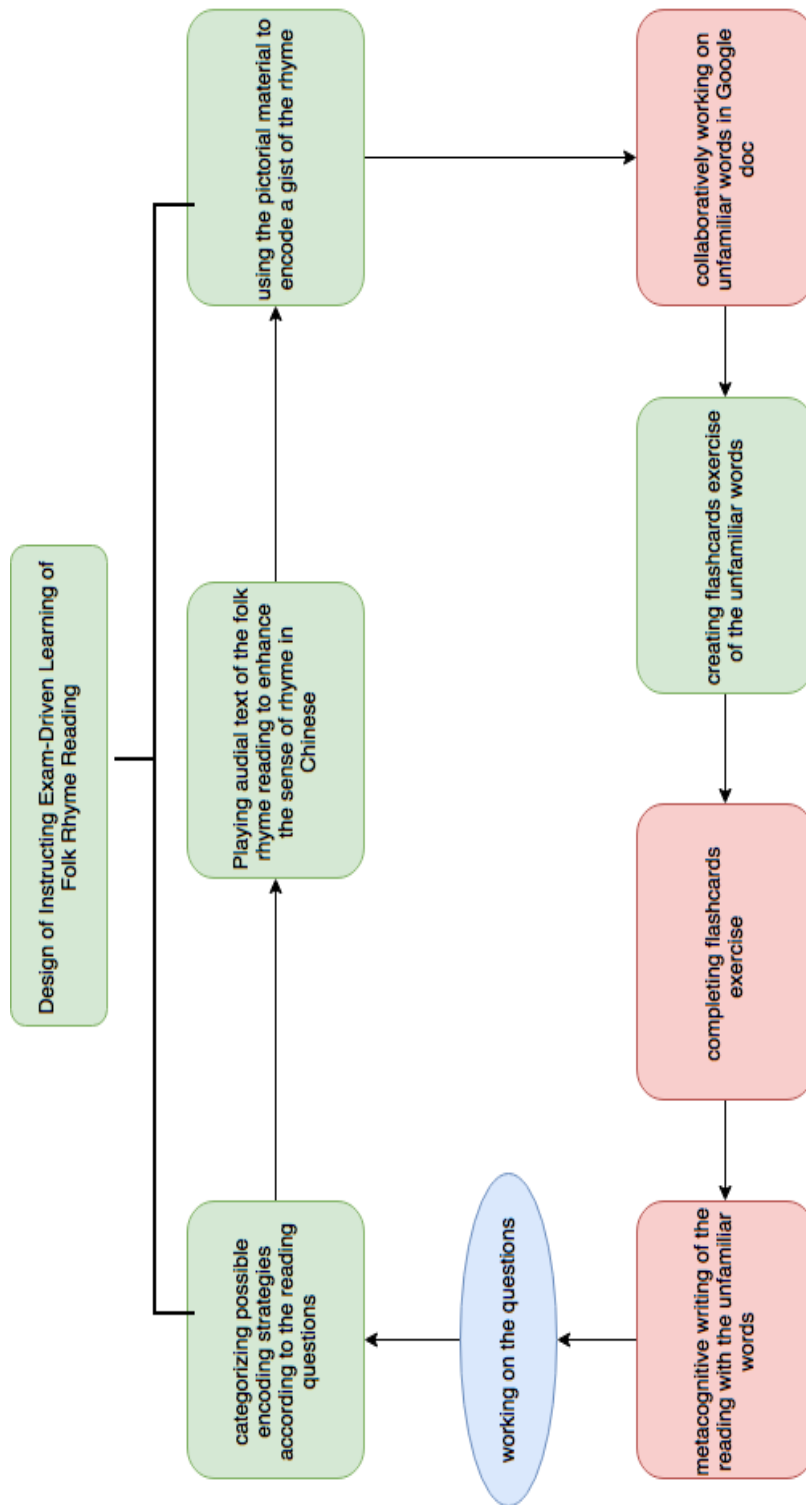


Figure 2

Flowchart of the design
(red-students,
green-instructor,
blue-student and instructor)

After reading and comprehending the rhyme with the auditory encoding and elaborative encoding strategies, learners can work on unfamiliar words by collaboratively working on a Google doc file as a maintenance exercise (Figure 3).

Figure 3

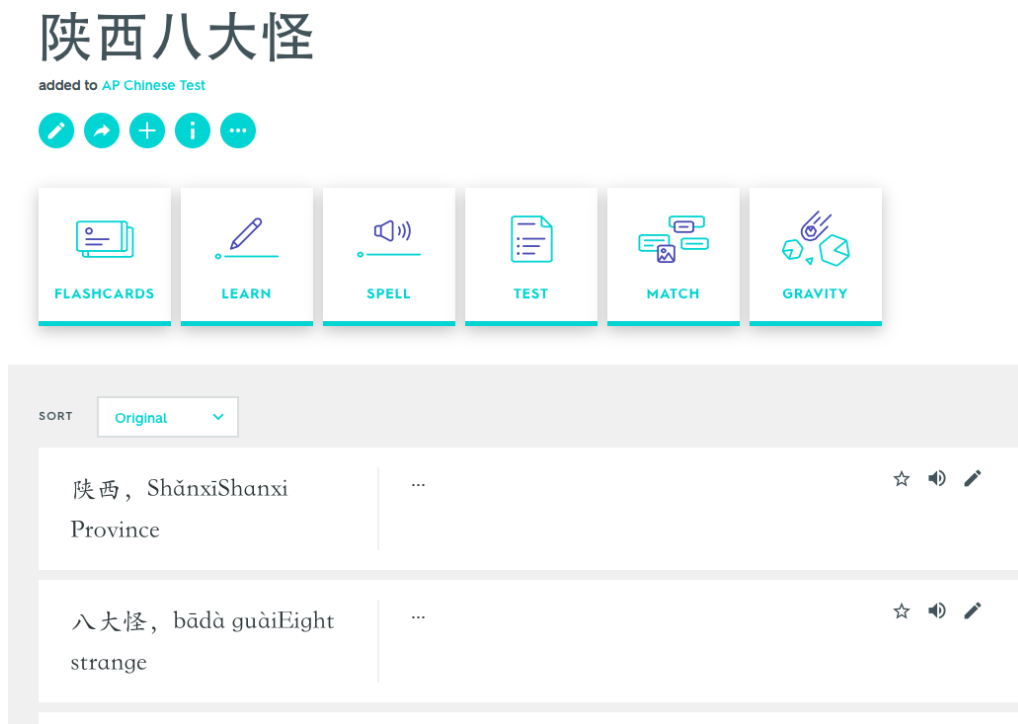
A Google doc File of unfamiliar words from "Eight Odd Things" by students

29. 陕西 Shānxī Shānxī Province
30. 八大怪 bā dà guài Eight strange
31. 韵律 yùn lǜ rhythm
32. 像 xiàng Like
33. 难分开 nán fēn kāi Difficult to separate
34. 戴 dài wore
35. 唱戏 chàng xì Act in an opera
36. 吼 hǒu Roar
37. 辣子 là zǐ Spicy
38. 一道菜 yī dào cài A dish
39. 锅盖 guō gài
40. 半 ban half
41. 蹲 dūn squat

To enhance the vocabulary memory, the instructor will create a set of recognition tests as low-stakes tests for learners to rehearse the words again. Flash cards are an example of this type of low-stakes test (Figure 4). As Larsen, Butler and Roediger (2008) point out, low-stake tests help learners improve learning by improving information retention. Users can rehearse the words by using the functions of “learn”, “speller”, “test”, and play “scatter” and “gravity”.

Figure 4

Flash card Activity on Quizlet



After giving students an exam from the test bank, the instructor will give them a higher stakes assessment, such as a reflective writing exercise. Learners will use the words they accumulated to do a 200-word reflection writing about the rhyme. As Larsen, Butler and Roediger (2008) advocate, promotion tests that ask students to apply knowledge rather than simply recall information help students better establish higher-order retention. Reflective writing is metacognition; thinking about thinking. Learners use reflective writing to recall how they previously processed their learning.

For higher-proficiency Chinese language learners, they will be able to read the questions once they have completed the above-listed activities. At this point, learners will have various encoding strategies, which they can apply. Learners will not only give correct answers, but they

will also discover enhanced learning abilities for other styles of reading; metacognitive writing (promotion test) will also facilitate their writing ability.

Conclusion

Students in an AP language class aim to achieve higher scores in AP exams. It is important for instructors of AP language courses to understand how non-native speakers process comprehension of target languages. Based on student encoding and retrieval characteristics, instructional design should proceed from the exam questions. By categorizing encoding strategies accordingly, instructors can have a clear pathway to applying encoding strategies with multimedia assistance. For advanced learners, reflective writing using an unfamiliar vocabulary is a recommended metacognitive method to enhance retention of advanced language learning. This design aims to focus student-centered advanced foreign language classes through applying appropriate encoding and retrieval strategies. The design can also be implemented into instructions of other exam-driven instructional designs. For further study of how encoding and retrieval work in secondary instruction, more experimental research is needed to test the efficiency of this kind of design.

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